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JOURNAL
OF THE
ASIATIC SOCIETY OF BENGAL,
EDITED BY
THE SECRETARIES.

VOL. XXVIII.

Nos. I. to V.—1859.

“It will flourish, if naturalists, chemists, antiquaries, philologists, and men of science in different parts of *Asia*, will commit their observations to writing, and send them to the Asiatic Society at Calcutta. It will languish if such communications shall be long intermitted; and it will die away, if they shall entirely cease.”—

SIR WM. JONES.



CALCUTTA:

PRINTED BY C. B. LEWIS, BAPTIST MISSION PRESS.

1859.

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JOURNAL

OF THE

ASIATIC SOCIETY.

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No. I. 1859.  
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Decipherment of a Sanskrit Inscription dated in the fourteenth century, with a translation and notes.—By FITZ-EDWARD HALL, Esq. M. A.

The inscription here published was dug from the ruins of a temple in the village of Harsaudá, which lies about ten and a half miles from the town of Chárwá, in the district of Hoshungabad. I am indebted for it to Maulavi Muhammad Mazhar Jamil, the energetic Assistant Superintendant of Hurda and Hindia. The stone on which it is incised is now in my possession. A superficies measuring about eleven inches by thirteen comprehends the writing; beneath which are rude outlines of S'iva, and of seven other divinities, six male and one female, supporting him on either side.

Devapála, the ruler mentioned in this monument, does not seem to be identifiable with any mediæval prince of the same name, hitherto discovered. Nor has it been ascertained whether he belonged to the royal house of Málava which included the last Bhoja and his son Udayáditya in its lineage. From the manner in which he is spoken of it might, however, be inferred that his descent was not a source of particular pride; or it would have been detailed with the usual degree of amplification.

As the substance of this inscription is meagre, so is its language. And it is not only meagre. A number of deviations from the
No. XCVI.—NEW SERIES, VOL. XXVIII.

standard purity of the classical idiom will not fail to be perceived by the learned reader.*

ओम् । नमः शिवाय ।

सर्वकर्मसमारम्भे गीर्वाणैर्यो नमस्कृतः ।

स मया पार्वतीपुत्रो हेरम्बः प्रार्थ्यते चिरम् ॥ १ ॥

भारती भवतां भूयाद् वागुक्तासविकाशदा ।

जगज्जाद्यं तमोऽधस्तात् कुर्वन्ती भा रवेरिव ॥ २ ॥

केशाः कज्जालिकाशाभाज्जङ्गारा हि पिनाकिनः ।

विधिगा गतयो दद्युः शं वो जाम्बुनगौकसः ॥ ३ ॥

संवत् पञ्चसप्तत्यधिकद्वादशशताब्दे १२७५ मार्गसुदि ५ शनौ
स्वस्तिश्रीमद्भारायां समस्तप्रशस्तोपेतसमधिगतपञ्चमहाशब्दालङ्कार-
रविराजमानपरमभट्टारकमहाराजाधिराजपरमेश्वरपरममाहेश्वर-
श्रीलिखायाप्रसादवरलब्धप्रतापश्रीमद्देवपालदेवचरणानां महीप्रवर्ध-
मानकल्याणविजयरान्ये सति ।

अधिके पञ्चसप्तत्या द्वादशाब्दशते शके ।

वत्सरे चित्रभानौ तु मार्गशीर्षे शिते दले ॥ ४ ॥

पञ्चम्यन्तकसंयोगे नक्षत्रे विष्णुदैवते ।

योगे हर्षणसञ्ज्ञे तु तिथ्यर्धे धातुदैवते ॥ ५ ॥

श्रीमदुन्दपुरे पूर्वमासीद् धोसीति पूरुषः ।

ख्यातः सर्वगुणैर्लोके विलोके सम्मतः सताम् ॥ ६ ॥

तदौरसः शुद्धमतिर्बभूव

श्रीबिल्हणोऽनङ्गसमानमूर्तिः ।

तस्याऽऽत्मजोऽभूद् वणिजां महात्मा

* A few faults of the engraver are here noted as specimens. The first stanza has प्रार्थ्यति चिराम् : in the third it may be that he ought to have written विविधः and the seventh metrically exhibits दल. In the twelfth stanza the original has सुमहादयशः. This must be corrected as in my text, or else to सुमहायशः

श्रीछल्लनामा महनीयकीर्तिः ॥ ७ ॥
 तस्याऽनुजः केशवनामधेयो
 वणिकूपथे शुद्धमतिर्जने रतिः ।
 आसीत् तदा धर्मनिकेतनः सदा
 भूदेवभक्तः खजनेऽतिरक्तः ॥ ८ ॥
 तेनाऽकारि मनो धर्मे केशवेन सुजन्मना ।
 नलिनीदलनीरेण पश्यता सदृशं वपुः ॥ ९ ॥
 हर्षपूर्वात् पुराद् देशविभागे लोकनन्दनम् ।
 चकाराऽऽयतनं शम्भोरम्भोनिधिसमं सरः ॥ १० ॥
 तत्सन्निधाने हनुमत्क्षेत्रपालगणेश्वरान् ।
 स्थापयामास कृष्णादीन् नकुलीशमथाऽम्बिकाम् ॥ ११ ॥
 लोकानुरागतस्यागात् विप्रसन्तर्पणात् सदा ।
 देवार्चनाग्निहोमाभ्यामर्जितं सुमहद् यशः ॥ १२ ॥
 लोके ब्रूते केशवः सत्यवाक्यं
 मत्प्रासादं यो नरः पश्यतीमम् ।
 तद्दीपं मा भूतले सुप्रसिद्धं
 जानन्वेते सज्जनाः सर्वदैव ॥ १३ ॥
 महाजनानुरागेण श्रेयो मम वितन्वता ।
 कृता शस्ता प्रशस्तीयं धीमता देवशर्मणा ॥ १४ ॥
 शुभं भवतु लेखकपाठकयोः सर्वदैव । शिवमस्तु ।

TRANSLATION.

Om! Adoration to S'iva!

1. Persistently do I supplicate Heramba,* the son of Párvatí;† him who is reverently saluted, by the gods, at the outset of all undertakings.

* A name of Ganes'a, the mythological patron of letters, and, more particularly, the remover of obstacles.

† The daughter of Himálaya, and wife of S'iva.

2. May Bháratí,* who dispels the darkness of the world's stolidity, as the light of the sun *dissipates the gloom of night*, confer upon you celebrity for increase in *the power* of discourse.

3. May the *matted* locks of Pinákin,† resembling, *in colour*, black bees on the water-lily, and adorning the quarters; and *his* menacing utterances; *and* the regulated evolutions of him whose abode is on the *jambu*-bearing mountain;‡ bestow upon you prosperity.

In the year twelve hundred and seventy-five, *or*, in numerals, 1275; on Saturday, the fifth *day* of the moon's increase in *Mārga* :§ when, in the happily|| thriving *city* of Dhára, was held the government—whose fortunes and successes were greatly increasing throughout the earth—of the feet of the fortunate Devapála Deva; endowed with all excellencies; resplendent with the decoration of the five great titles *which he had* obtained;¶ supreme sovereign, great king,

* Or Saraswatí; the goddess of learning. A victim to the incestuous passion of her father, Brahmá, she is fabled to have been childless.

† That is, S'iva; from *pináka*, his bow, or trident.

‡ This is an epithet of Pinákin, with which word it might, in translating, have been placed in opposition.

Mandara, or else Merumandara, is the mountain on which stands, according to the Purāṇas, a gigantic *jambu*-tree, the *Eugenia Jamboo*.

There is an allusion here to the boisterous dance of S'iva, the *tāṇḍava*.

§ Or *Mārgas'irsha*, as below.

|| The position and use, in this place, of *swasti*, 'happily,' are peculiar. Another interpretation is, however, admissible.

¶ The Sanskrit of the words from 'endowed' to 'obtained' is identical with a clause which Colebrooke renders with an expression of distrust as to his understanding the whole of it. See his Miscellaneous Essays, Vol. II., p. 303, note.

It may be erroneous to take *samastapras'astopeta* as an independent expression. Again, but for the order of the original words, it might be considered that 'the five great titles' are enumerated in 'supreme sovereign,' &c. Only four of these denominations are, however, specified, on some occasions where the five titles are spoken of in proximate connexion with them. See, for instance, Colebrooke ubi supra.

Mr. Walter Elliot says: "Lord of the *pancha mahás'abda*, or 'five great sounds,' is a title always joined with that of *mahá-maṇḍales'wara*, and never with that of the sovereign, in any of the more modern inscriptions. It does, however, occur among the titles of Pulakes'in, in the copper inscription of Capt. Jervis." Journal of the Royal Asiatic Society, Vol. IV. p. 33, note. All that can safely be

chief ruler, lord paramount, emperor ; to whom majesty was derived from the boon of the favour of the auspicious *Liswáyá*.* or, expressed metrically ;

4. In the *S'aka* year twelve hundred and seventy-five, called *Chitrabhánu*,† in the light fortnight of *Márgas'irsha*,

5. Its fifth day and Saturday‡ concurring, under the asterism whose superintending divinity is *Vishṇu*,§ during the *yoga*|| termed *Harshana*, and the *karana*¶ over which *Dhātṛi* holds the presidency ;* the matter under record was transacted.

said touching the phrase in discussion is, that its import is not yet determined, nor the grounds which were reputed as authorizing a ruler to affect its appropriation.

* Perhaps the king's mother ; possibly, the local name of some goddess. But the Sanskrit is hardly decipherable with any certainty.

† As the present inscription came from the south of the *Nerbudda*, it is deserving of remark that its style of date is at variance with the alleged local variations in reckoning the cycle of *Bṛihaspati*. See the *Asiatic Researches*, vol. III. p. 217 ; 8vo. edition.

‡ In the original, *Antaka*, or *Yama* ; the name of the regent of Saturday. For convenience of reference, the regents of the days of the week are subjoined :

Sunday.	<i>S'iva</i> .
Monday.	<i>Durgá</i> .
Tuesday.	<i>Guhá</i> .
Wednesday.	<i>Vishṇu</i> .
Thursday.	<i>Brahmá</i> .
Friday.	<i>Indra</i> .
Saturday.	<i>Yama</i> .

§ This constellation is the twenty-third, or *Śravaṇa*.

|| For the meaning of this technicality, and for a list of the *yogas*, see *Colebrooke's Miscellaneous Essays*, vol. II. pp. 362 and 363. Also see *Col. Warren's Kāla-sankalita*, p. 74.

¶ Called, in the Sanskrit, by its less usual name, *tithyardha*, or 'half a lunar day ;' the length of its duration. See *Colebrooke's Miscellaneous Essays*, Vol. II. p. 364.

* *Dhātṛi* is *Brahmá* ; and his *Karana* is *Bálava*. The *Karāṇas* and their tutelars are particularized below :

Variable <i>Karāṇas</i> .	Tutelars.
1. <i>Bava</i> .	<i>Indra</i> .
2. <i>Bálava</i> .	<i>Brahmá</i> .
3. <i>Kaulava</i> .	<i>Mitra</i> , the sun.
4. <i>Taitila</i> .	<i>Aryaman</i> , the sun.

6. In the auspicious *town of* Undapura* there lived, in time past, a person by name Dhosin; renowned, in the world, for every virtue, and highly considered by the saints in heaven.†

7. His lawfully begotten son was the fortunate Bilhana; pure of purpose, and, in form, the peer of Ananga.‡ And his son was the fortunate Dhalla, so called; high-souled among merchants, and of repute challenging respect.

8. His younger brother, who bore the appellation of Kes'ava, was a *man* of guileless mind in affairs of traffic, kind to the people, an abode of merit, ever devoted to the gods of the earth,§ and warmly attached to his own relatives.

4. Regarding *his perishable* body as like a drop of water on the leaf of the lotus, the well-starred|| Kes'ava applied his heart to pious observances.

10. In the neighbourhood¶ of Harshapura he constructed a superb* temple to S'ambhu, and a reservoir like the sea.

5. Gara.	Bhú, the earth.
6. Vanija.	Ramá.
7. Vishti or Bhadrá.	Yama.

Invariable *Karaṇas*.

1. S'akuni.	Kali.
2. Chatuspada.	Ukshan.
3. Nága.	Nága.
4. Kinstughna.	Maruta.

* This is not to be mistaken for what is now vulgarly called Indore; a corruption, it is said, of Indrávara.

† *Viloka*, 'the other world;' heaven, or hell, according to circumstances. In the acceptance of *paraloka*, this word has no place in our dictionaries.

‡ 'The bodiless;' an appellation of the Hindu Eros, whom S'iva reduced to ashes.

§ A magnificent epithet of Bráhmans.

|| To translate *su-janman*, conformably to its etymology, by 'well-born,' would convey a wrong impression in our idiom.

¶ So I render *des'a-vibháge*, at a venture. 'In a section of the place' would be a strict translation. The fifth case after this term may be accounted for by the particle *vi* which it embodies. But the Sanskrit is impure.

* Closely, 'pleasing to the people.'

11. Near him* he caused *idols* to be set up of Hanumat, Kshetra-pála, Gaṇeś'wara, Kṛishṇa, &c., Nakulís'a, and Ambiká.†

12. For *his* general benevolence, *his* bounty, *his* constant entertainments to Bráhmans, *his* adoration of the gods, and *his* offerings to fire, he acquired the highest renown.

13. The *following* words of good faith Kes'ava addresses to the community: 'as for human kind who look upon this my temple, well known over the face of the earth, may these worthy people at no time whatever think ill of it.'

14. This elegant eulogy *was* composed by the learned Deva S'arman, had in esteem by the great,‡ and the augments of my good fame.

* The writer's meaning is, 'near the image of S'ambhu, sheltered by this temple.'

† Kshetrapála, or 'the guardian of the soil,' is, at least now-a-days, a personage of uncertain or various identification. At Benares he is one with Bindu-mádhava, among the Vaishṇavas; and, with the S'aivas, the same as Bhairava. The latter view has the support of the *Baṭuka-bhairava-stotra*. In many places, as I know from personal observation, the name of this agrestic protector is bestowed on figures of Hanumat.

The unnamed divinity, coupled with Kṛishṇa, is Garuḍa. His place is at the right hand of the principal image of a group, as that of Hanumat is at the left hand.

Gaṇeś'wara is Gaṇeś'a, elongated for the sake of the metre.

Of Nakulís'a, as here intended, I can affirm nothing positive. But it is not necessary to presume a mistake, in this place, for *nakules'a* or 'lord Nakula,' one of the forms of S'iva: since this god, as S'ambhu, is already embraced in the sacred company under description. In Nágojí Bhaṭṭa's scholia on the *Chandí-páṭha*, ad finem, is a passage, purporting to be taken from the *Váráhi-tantra*, in which the Destroyer is called Nakulís'a, as being the consort of Nakulí, a Tán-trika name of Durgá. Nakulís'a—written, perhaps, Nakules'a also—is, again, an inferior manifestation of S'iva. Further, in what is stated to be an extract from the *Vámana-purána*, Nakulís'a is given as the title of one of S'iva's bands of attendants; that which is stationed at the west of him. Once more, Nakulí—as distinctly appears from the *Nakulí-vágíswarí-paddhati*—being Saraswatí, Nakulís'a is one with Brahmá. The worship of this divinity has, however, long been disused. I have never seen but a single temple to him, that at Pohkar, near Ajmere.

Ambiká is Párvatí. See the first couplet, and a note on it.

‡ This phrase may also import 'well-affected towards the great.' As the

May happiness ever attend the scribe and the reader of *this composition*. Be there auspiciousness !

Fort-Saugor, September 2nd, 1857.

inscription has so much to say of traders, it is just possible that *Mahájana* may intend this class of persons, and not 'great' or 'respectable.' The word, it should seem, sometimes bears this sense in Sanskrit ; but, perhaps, by insensible or ignorant adoption of the signification attached to it in the spoken languages. See Colebrooke's Digest of Hindu Law, &c., Vol. II. p. 303, foot note ; 8vo. edition.

The continuous notation, observed on the stone, of the metrical portion of this record has been followed in the transcript now edited.

These fourteen stanzas are all in the *Vaktra* measure, three of those which succeed the prose being excepted. That numbered as the seventh is *S'ubhá* or *Buddhi*. I shall recur, on a future occasion, to the class of mixed metres to which this appertains. The metre of the eighth stanza is likewise composite, a species of *upajáti*, but of which I can discover no specific appellation. Its first and fourth quarters are *Indravajrá* ; its second, *Vans'astha* ; and the third, *Indra-vans'á*. The thirteenth stanza is *Sáliní*.

I avail myself of this opportunity to rectify an error into which I have fallen regarding the acceptation of the phrase *pádánudhyáta*. See p. 226 of vol. xxvii. of this Journal, foot-note. My opinion there expressed, besides having the weighty support of Colebrooke, was based upon an examination of all the instances, accessible to me when I wrote, of the employment of this locution. But it appears, from two examples occurring in the same inscription, that it sometimes indicates merely a kindred successor, or, perhaps, only a successor. Where, of two brothers, elder and younger, the latter accedes to the throne in sequence to the former, the words *pádánudhyáta* are, in the cases alluded to, used to denote their relation as consecutive princes. See the Journal of the Bombay Branch of the Royal Asiatic Society, for January, 1851, pp. 219 and 220.

A Sketch of Toungoo History.—By Rev. Dr. F. MASON.

To the Editor of the Journal of the Asiatic Society of Bengal.

SIR,—Perhaps none have read Capt. Yule's paper on the ancient Buddhist remains at Pagán with more interest than myself, especially his invaluable historical note. I am full in the belief that when we become better acquainted with the Talaing and Burmese historic literature, we shall have a history of the country nearly as accurate as Macaulay's, if not quite so poetic. Native histories are difficult to be obtained, when obtained difficult to read, and when read, difficult to translate, so as to interest European readers. When I came up to Toungoo in 1853 I read two different histories of the country in Burmese, but have never before offered a sketch of their contents to the press, for the reason given above. Capt. Yule's article, however, exhibits so clearly the lack of historical documents on this country, that every contribution, however small, to supply the deficiency, cannot but be acceptable. It is to be regretted that so few thoroughly versed in the languages have leisure to do any thing in this department, we are indebted to Col. Burney and Major Phayre for nearly all we know of Burmese history.

Capt. Yule is surprised to find all the details of the architecture at Pagán of Hindu origin; but there is little reason for astonishment when it is known that Anoratha, or Anoratha Sau men,* when he established Buddhism in Pagán, built all the Pagodas and temples in Pagán after the exact models of those then existing in Thatung or Satung, of the same size, and in the same order. Such is the testimony of Talaing tradition, and I believe of Talaing history. There is proof on the pages of your Journal,† that he sent to Thatung for Rahans and priests versed in the Pitakat to teach his people, and that he obtained the descendants‡ of Sona and Uttara, the first Buddhist missionaries from Central India to Burmah. As Thatung was then the principal city in the country for religion, it probably held a similar distinction in the arts, and as Solomon sent

* အနောရထဝေါမင်

† May, 1834. "Inscription from Ramree Island."

‡ Erroneously rendered in the Journal. "Through the instrumentality of Sonathera and Uttarather, and their disciples and survivors."

for his builders to Tyre, so Anoratha procured his from Thatung; while there is room for little doubt that Thatung was originally a Hindu colony, and it is quite certain that it was in frequent communication with Ceylon. Capt. Yule says: "Suvannabumme," he adds, but unfortunately stating no authority, "is still the classic Pali name of Satung." No better authority will be required than that furnished by your Journal. The inscription from Ramree Island* was made subsequent to A. D. 1786, and in that Suvannabumi stands as the classic name of Thatung. "In the sacred era 236," as we read, "religion was established by the venerable Sona and the venerable Uttara in Suvannabume, the Thatung country."†

There is great confusion and often contradiction of dates in all the native histories through the carelessness of copyists. We cannot be certain of an approximation to accuracy without comparing different copies, and different histories.

Yours very sincerely,

Toungoo, December 15th, 1857.

F. MASON.

HISTORY OF TOUNGOO.

The history opens with a brief epitomy of Gaudama's life, and states that he came to the country of Toungoo, here denominated Zeyavatana.‡ When he reached the place where old Toungoo was subsequently built, he said to his favourite disciple Unanda: "Here thou and I were brother white cocks in a former state, each with five hundred followers, and fed in this place. Hereafter my relics will be enshrined here and worshipped." Crossing the river, on the east side, on the site of the present famous Pagodas of Myatso-nyie-noung,§ he said to Ananda: "Thou and I were

* See note † above.

† Rendered in the Journal: "In the country of Suvanna bumi (in Burmah called Sathum)."

‡ ဇေယျဝတီ

§ မြတ်ဗေဒိဋ္ဌိနောင်

born white cocks in this place, and here we came at night to roost. Hereafter my relics will be enshrined here and worshipped."

After stating that the Pagodas were not built in the days of Dwattaboung, the founder of Prome, A. C. 443, the history passes to Dammasoka. "In the sacred era 223 [A. C. 320], Dammasoka, the universal monarch, residing at Palibrotha, having obtained the relics, called up the rulers of eighty-four thousand countries and provinces, and gave to each eight portions of the relics, commanding them to return and enshrine them in their respective countries, building over them Pagodas, and digging wells and tanks in their vicinity. The Toungoo chiefs took their relics and built four Pagodas over them in the places previously mentioned by Gaudama."

From Asoka the history passes abruptly to Narapadiesethu king of Pagán, whose classic name is here given Tampadiepa* country. He descended the Irrawaddy A. D. 1191, and guided by astrological prognostications, came up the Sitang to the Toungoo Pagodas, which being in ruins he repaired them, and on leaving, appointed one of his ministers, Nandathurieya† governor of the country, who made Kampamyen‡, on the Sitang in the north part of the province, the seat of his government. He was succeeded at his death by Men Hlazo § of whom nothing is said, but that his son Thawonlenkya|| ruled after him. Thawonlenkya, changed his capital and settled on the north side of Htswa creek, twenty or thirty miles north of the present Toungoo. Here he founded a city which he called Kya-khat-wara,¶ where people gathered to him in great

* တမ္ပဒိပ

† ခုဒ္ဒိသူရိယ

‡ ကမ်ပါမြင်

§ မင်ထွစေ

|| သဝံလကျင်

¶ ကြခတ်ဝရ

numbers from every direction. Warieyu,* king of Martaban, came up, destroyed the city, and carried away the ruler and his family to the town of Thu, between Shwegyen and Sitang. This event is placed A. D. 1256. According to Talaing history, this king there called Wareyo, did not come to the throne till A. D. 1281. The same king appears, though not by name, in the 'Inscription on the great bell brought from Aracan,† according to which he did not ascend the throne of Pegu till A. D. 1370; but the same event in the history of Martaban is placed in 1289. If the bell inscription be assumed as the most correct, then Toungoo history must be out a whole century or more.

While in captivity, Thawonlenkya had two sons born unto him, the great Thawon‡ and the little Thawon; and when about to die, he charged his sons, saying, "This is not our country but Ramey, go to Zeyawatana. If you wish to be good men, go up the river Athawatie POUNG-lOUNG,§ and follow up Khaboung creek till you reach a small mountain spur [Toungoo]."

¶ In accordance with their father's instructions, after his death, they came up the river Sitang and established themselves at the place indicated, A. D. 1278.

Another character is now introduced. A teacher at the town of the Htieling, said to one of his pupils, Karen-ba, "If you go south you will become a good man." He went south, and after remaining some time at Kentha, finally removed, and took up his abode in the south-east of Kaylen, naming the place the Karen city. Tradition says that this man was a Karen, his name which signifies "Karen-father," and his founding a city, called "Karen city," confirms the

* ဝါရီယူ In Talaing history ဝရေရော

† Journal of A. S. of Bengal, April 1833. The translator places the event in 1622 by omitting a figure in the date, and changing the era. The text says in the sacred era 1913 [သာသနာတော်ဘေသာဒွင်] but the translator drops the first figure, and then renders it as the vulgar era.

‡ သဝန်

§ အါသာဝတီပေါင်းလောင် i. e. the Sitang.

¶ တောင်ဂူ

tradition, yet many Burmese say he was a Burman, and his name Karen-ba, an epithet and not his proper name.

When the brothers heard of Karen-ba's proceedings, they communicated with him, and entered into an agreement to found a city together. After traversing the whole region in search of a suitable locality, they ultimately determined on the site of old Toungoo some twenty-five miles north-west of the present city, where they founded "Great Toungoo," A. D. 1281. It is said they built mat houses on each of the four sides of the city to the four great guardian spirits, or Nats, making offerings to each; which proves they were not pure Buddhists.

The elder brother was killed by the younger and died A. D. 1317. The younger brother survived seven years dying A. D. 1324; and his widow and son being discovered in a conspiracy to assassinate Karen-ba, they were both put to death. Karen-ba died a natural death A. D. 1342; but the next two kings who succeeded him were murdered after short reigns; when Thimpauka came to the throne, in whose days the kingdom flourished. He exchanged ambassadors with the Talaings, the Burmans and the Yunes;* and conquered the five provinces of Yelway.† Associated with the Talaings, he made war on the king of Prome, Tsau yan nung,‡ took him and put him to death A. D. 1370. Passing over two other kings, we meet with Men Boung,§ who sent presents to the king of Ava Tswatsokay|| to maintain peace, and also to Byanya-oo,¶ king of Pegu. This king, according to Talaing history, died A. D. 1388, which synchronises with this history. This Men Boung patronised the cultivation of the lands, it is said, as well as the making of offer-

* “ယွန် Cochin China,” says Judson, but I take them to be Shans.

† ရေလွဲ

‡ ဝေါရန်နောင်

§ မင်ဘောင်

|| စွာဝေါက်

¶ ဗျာညာဦ

ings. While absent at Myahla, a town in the northern portion of the province,—where our present Deputy Commissioner, Capt. D'Oyly, is founding a Shan colony—the Shans entered Toungoo and assumed the reins of government, but he returned suddenly in a single night, attacked the Shans, and defeated them with great slaughter. He died A. D. 1392. Passing on, we find A. D. 1428 the king of Toungoo allied with Byanya-yan* king of Pegu in a war against Prome. The Pegu king, who, according to Talaing history, reigned between A. D. 1418 and 1450, besides land forces, brought fifty war-boats against the city; and the king of Toungoo brought two hundred elephants, one thousand horsemen, and twenty-nine thousand infantry. They took the city and carried off much plunder.

A daughter of the king of Toungoo having married the son of Narapadi king of Ava, Toungoo became a dependency of Ava. Narapadi died, it is said A. D. 1468, and the Ava Chronicles, as translated by Col. Burney, represent him as reigning in 1449.

After twenty-nine kings had reigned Zeyathura† came to the throne, an independent sovereign, A. D. 1485. He removed his capital, first to the mouth of Kaboung creek where he built Dwayawadie,‡ and next to the site of the present city of Toungoo, which he built and named Ketumatie§ [i. e. Possessed of the royal banner] A. D. 1502 says one history, A. D. 1510 says another. This name was retained in official documents, but Toungoo, the name of the first city transferred to it in common use, though being situated in a plain, far from the mountains, it is inappropriate. One hundred and seven thousand, five hundred and twenty-four persons were said to have been employed in building the city. Zeyathura had several bráhmans at his court, and they exercised considerable influence

* ဗျာဏှာရန်

† ဒေဝျသုရ

‡ ခွါရာဝတီ The same name appears to have been given to Sandoway.

See Journal May, 1854.

§ ကေတုမတီ This name appears to have been previously given to Pagan.

Journal April, 1838.

over the religion of the people. On my arrival, in 1853, I found a ruined building in the north-west corner of the city, which contained decayed wooden images of Vishnu, and some other Hindu gods, to which the inhabitants were in the habit, formerly, of making offerings; and in the account of the ceremonies at the completion of the city, it is said that Ganesa was placed on a stone slab on the south side of the city. In the centre was an image of Gaudama with the Pitakata before him. The people were assembled without the walls and a procession formed, with the king at the head, who entered the city at the principal gate on the east side. When he reached the outer gate of the palace, the bráhmans and the chief architect exclaimed: "Let the ruler of this land and water, the excellent king of the law, possessing great glory, ascend into the golden palace which he has built; that he may observe the ten laws of kings, that he may give, during the whole of his life prosperity to religion and to the inhabitants of the country." At the foot of the palace steps, he did homage to "Brahma, Indra, Devas and to the three objects of Buddhist worship, exclaiming: "I worship the Buddha, I worship the law, I worship the priesthood."

Soon after the completion of the city, the king was involved in a war with Ava, then ruled by Narapati, the "Shwe-nau-kyany-shang, proper name Narapati" of Crawford's table, there said to have ascended the throne A. D. 1501, which synchronises with Toungoo history, and goes far to confirm the statements of both. A. D. 1503, Zeyathura went out to meet the king of Ava with twelve hundred fighting elephants, six thousand horsemen, and fifty thousand foot, who was defeated and entered into a treaty. Another war was followed by another treaty, and the king of Ava finally gave his daughter in marriage to the king of Toungoo; who died A. D. 1531.

Mentara his son ascended the throne, and conquered Pegu to which city he removed the seat of his government; and gave Toungoo to "the Shan Menyay-thie-ha-thu,"* who, at his death, appointed his younger son Thie-ha-thu, his successor. After a short period his elder brother Htsen-phu-shen took the reins of government, but when he obtained the throne of Pegu he restored Toungoo

to his brother, who ruled under the name of Menkhaung.* This was A. D. 1551, and Talaing history has a Hsen-phu-shen king of Pegu, who died A. D. 1562.

Menkhaung was succeeded by his son Menyay-kyau-ten,† who built a large palace in the middle of the city, the ruins of which still remain. He was succeeded by his elder brother, Natshen-maha-damma-yaza.‡ In the year 1601, the son of Nyounyan-maha-damma-yaza,§ king of Ava, came against Toungoo, and took it. In Crawford's table, Nyoun-yan, there "Naung-ram," ascended the throne of Ava A. D. 1597, quite in agreement with this history. He left Natshen in charge of the city, but took his mother and his two brothers Menyay-kyau-ten,|| and Menyay-kyau-tswa,¶ and placed them in the city of Penya.* In the year 1611, intelligence was sent up from Toungoo to Ava that the Portuguese and Aracanese were about to come against the city. The king gave orders for succours to be sent to Toungoo in charge of Menyay-kyau-ten, but before he arrived, Toungoo had been taken, and Natshen with all his court carried captive to Syriam, A. D. 1612. In the same year the king of Ava took Syriam, and "having done in it as he wished," returned with many captives.

The next and last date in the book is A. D. 1637, where it is stated, that all the officers of government received their appointments from Ava, to which place all the taxes collected were to be carried. With the complete subjugation of the country to Ava, the history closes.

* မင်ခေါင်

† မင်ရဲကျော်တင်

‡ နတ်ရှင်မဟာဓမ္မရဇာ

§ ညောင်ရမ်းမဟာဓမ္မရဇာ

|| မင်ရဲကျော်တင်

¶ မင်ရဲကျော်စွာ

* ပင်းယ

Reply to Mr. Pratt's letter to the Asiatic Journal on the Indian Arc of Meridian.—By Captain F. P. TENNANT, Bengal Engineers, F. R. A. S. 1st Assistant G. T. Survey of India.

A couple of days ago, I received the copy of the letter from Mr. Pratt to the Secretary of the Asiatic Journal. As I am not a member of the Society I should be much obliged by your communicating the following answer.

1. I must explain; that the direction of the plumbline at any point of the earth's apparent surface is determined by combined action, of the centrifugal force resulting from the earth's revolution round its axis, and the attraction of every particle of the matter constituting the earth. These are the only forces in action; and the result would be; were all the matter in the earth free to arrange itself; that the figure would be rigorously an ellipsoid of revolution, whose ellipticity would depend on the law of the earth's density in approaching the centre.

2. The earth however is not fluid. The position of every particle of by far the greatest portion of matter is almost unchangeable. In addition to this, there are many projections from the general surface, and depressions below it, as well as internal irregularities of structure. All these are small with reference to the enormous mass of the earth itself which may therefore be most simply considered as an ellipsoid of revolution + superfluities of matter in certain positions — certain deficiencies. So also the total attraction of the earth is the resultant of the attractions of the ellipsoid and the separate irregularities.

3. Were the ellipsoid alone existent, the plumbline would be every where normal to its surface, that being one of the conditions of equilibrium, but in consequence of these irregularities the direction of the plumbline is changed and there is hardly any point of the earth's apparent surface where it is perpendicular to the surface of the fundamental ellipsoid.

4. In geodesical operations we project all our stations, and consequently the arcs joining them on a surface which is always perpendicular to the plumbline; that surface being selected which

is defined by the mean sea level ; and it is on this consequently that our arcs are measured. As this differs from the fundamental ellipsoid, only in consequence of the attractions of the irregularities, it follows, that, could we remove *all* the consequences of the attractions of *all* the irregularities, we should have the lengths and amplitudes of our arcs as though they were measured on the fundamental undisturbed ellipsoid. *Every difference is caused by some irregularity* ; and this is certain, though we may be unable to assign its origin. That we shall ever be able to account for all these differences I do not expect. Omniscience alone could assign the places and masses of all the portions of the earth—but, that irregularities sufficient to account entirely for every deviation from the fundamental form exist appears a result of the laws of matter absolutely unquestionable.

5. The case of the form of the earth is thus assimilated to that of the orbit of a planet. Did the solar centre of our system alone exist with one planet, this last body would describe a rigorous ellipse about the sun ; but, in consequence of the existence of other planets, this mean ellipse nowhere satisfies observation, but we can always find an ellipse which will correspond to three observations but will soon exhibit sensible deviations from observation. It is universally recognized that this is a legitimate consequence of the law of gravitation. No one for many years has ventured to doubt that the apparent irregularity of a planet's motion is caused by the attraction of other planets. Theory has fully accounted for all the deviations ; and lately, when the observed positions of the planet Uranus were found undoubtedly to differ from the computed places after all known corrections were applied, Astronomers did not assert that the orbit was nearly but not quite an ellipse, that the law of change could not be assigned, &c. ; on the contrary, the development of the irregularity brought about a general tendency to seek its cause, and finally, Messrs. Adams and Leverrier predicted within narrow limits, the place and mass of the disturbing planet which we now call Neptune. Had they followed the course Mr. Pratt seems to take, they would have upheld the irregularity of the orbit ; and, what is now a triumph for the universal law of gravitation, would have been a reproach to science.

6. The uncorrected data of any two arcs close together will give

an ellipse strictly analogous to that in common use in physical astronomy and known as the orbit due to *the varied elements*; whereas the mean or fundamental ellipse derived from a number of distant observations will nearly, though not quite, satisfy all and bear the same relation to the previous one that the mean orbit does to the varied orbit.

7. Here the analogy ceases. The Heavenly bodies in connection with the sun are few and definite; we can thus assign the law of variation of the elements of the orbits. On the earth we cannot, and in the heavens as on the earth the varied elements without this law, are useless. The mean elements in the heavens would give places not very far removed from observation for a limited time, on the earth they would do so always, the difference arising from the motion inter se of the celestial disturbing masses and their fixity on the earth.

8. I have now I think sufficiently explained my reason for considering (from theory) the true form of the earth to be an absolute ellipsoid. I now proceed to consider Mr. Pratt's 3rd and 4th paras. —Arguing from the known changes in the form of the apparent surface which is visible to our eyes, Mr. Pratt reasons that there are changes in the curvature of the unperturbed surface, by which I mean, that which is the result of removing entirely the effects of all irregularities. Nothing could I think possibly be more fallacious than the argument. The change of outward form of the earth is caused by the transference of matter, and it is known principally by relative changes in the height of adjacent parts. In consequence of these changes, are also changes in the perturbed form of the earth, but when we eliminate all the effects of disturbing matter we evidently must, both before and after the changes, attain the identically same fundamental form.

9. Indeed we only know of these so-called actual changes except in very exceptional cases* (which moreover are of small extent) by reference to the sea level whose changes (being those of the disturbed surface) are small in comparison, if the fundamental form be fixed. If that, however, be liable to variation we have lost our reference, and we cease to have evidence of the changes of height.

* Such as the volcanic peak Jorulco and Coral Isles, and landslips.

10. From what I have said it immediately follows that the coincidence of the deduced form of an arc with the fundamental one is evidence of the absence of local disturbance or compensation for its effects, while deviation from the fundamental form shows in itself that the local disturbance has been either wrongly estimated or entirely neglected. If this be not so, we have to add to a sufficient and actually existent though numerically unassignable cause for the difference, one whose existence is uncertain, if not, as I believe, impossible.

11. Mr. Pratt appears to rest his opinion that I have misunderstood the subject, on the fact that I have not gone through his voluminous computations and produced a new result. I have not been guilty of this presumption. Our knowledge of the forms of the disturbing masses is very imperfect, and their internal constitution is almost unknown, so that I cannot flatter myself that I should attain a result in which I had more confidence than in Mr. Pratt's; and the research required would be very great. I have therefore preferred showing that the result at which he arrives has no claim to be considered a satisfactory representation of the form of India either practically or theoretically; and, if I have succeeded (as I believe I have) my answer must be considered conclusive as to the existence of some flaw in Mr. Pratt's data or processes without my actually pointing out where it occurs. As, however, my avoidance of the subject has been misunderstood, I may say that there is some reason to believe that the masses of the Himmalehs have been considerably overstated in Mr. Pratt's paper, while no notice has been taken of the mountains of Central and Southern India.

12. In Article 7, Mr. Pratt remarks on the indefiniteness of my estimate of the attraction at Banog. With my opinions I could evidently have no such confidence in the best attainable estimate as would have justified the time and labour requisite for its production. The most cursory consideration of Mr. Pratt's estimated attractions at the stations mentioned in his paper with a knowledge of the position of Banog will show that I am justified in calling it enormous on Mr. Pratt's hypothesis. That such was the view I took, and that I did not extend Mr. Pratt's law as he appears to imagine, is evident since by it, the attraction would, in longitude, much exceed the 20' at which I took it.

13. The next point requiring notice is the note to page 11, where I submit Mr. Pratt is in error. The surface on which the arc is projected is that which is modified by local attraction or C_n of his figure and not C_B which represents that attained after eliminating the local attraction's effects. The stiling process is actually carried on and the reductions to the lengths of the arcs are necessary.

14. From the figure of the earth, the astronomer seeks to determine the radius or the length of the line joining his place to the earth's centre and the angle which this line (or its projection on the plane of the meridian) makes with the perpendicular to the surface. Mr. Pratt's figure being confessedly only very local cannot give these data.

15. The Geodesist again seeks to determine from one station whose latitude is known and also the azimuth and distance of a second, the latitude of the second, their difference of longitude and the azimuth of the first at the second. Mr. Pratt's figure cannot give these, as I have shown in the case of the longitude and reverse azimuth at Karachee.

16. In my second paper noticed by Mr. Pratt I say, "I have shown in my former paper that the ellipse given by Mr. Pratt for the Indian meridian is useless for Geodesical purposes. I have now, I think, shown reason to believe that there is no evidence which will warrant our considering that any real departure from the mean form exists," and again "the only figure of any Geodesical or astronomical importance is, that determined as usual from the consideration of a number of arcs situated in various circumstances as regards sources of probable local disturbance, I think I have supported this.

17. Were we possessed of a large number of observations of latitude and longitude extending over India or the whole world, the true step to take, after the astronomical precedent, would be to determine (which of course is theoretically possible) the size and position of the deflecting masses requisite to reconcile the observed places with those geodesically determined. Whether the requisite observations will ever be available, or the Analytical Giant who must use them, is almost beyond even speculation. Meanwhile, let

us put full faith in the law of gravity as not to be shaken by dubious analogies.

18. I trust I shall not be supposed to depreciate Mr. Pratt's analytical conclusion. All knowledge is gain and Mr. Pratt's law of dissection is an acquisition which will doubtless find its practical application in due time. At present we can only look on the results of the paper as an arithmetical illustration of the formula and as not to be employed in the question of the earth's figure.



Mr. Pratt's Second Letter on the Indian Arc.

To the Secretary of the Asiatic Society.

SIR,—In reply to Mr. Tennant's letter brought before the Society at its last monthly meeting, it appears to me quite sufficient to ask your readers to read again my letter in your Journal No. III. 1858.

The question appears to myself to be a very simple one, and I wonder at Mr. Tennant's not seeing it in the same light.* I can readily comprehend his being disappointed that the effect of the Himmalayas should be so troublesome; in this I can fully sympathise with him. But I have too great a respect for the Law of Universal Gravitation to leave out of consideration such a disturbing cause. These Himmalayas are as great a tyrant in the delicate problem of determining the curvature of the arc of meridian in Hindostan, as the planet Jupiter is in the Solar System. But as

* I have not noticed his analogy drawn from planetary orbits, simply to avoid being drawn into a discussion on Physical Astronomy. But I may say thus much, that this supposed analogy does not help matters at all. In the Survey in order to map the country, they use the Fundamental Ellipse. This analogy would therefore require that the Fundamental Ellipse should be used to find the place of a planet. But it is the "*Instantaneous* or *Varying Ellipse*" which is used for this purpose. It is the corresponding *Local* or *Varying Ellipse*, therefore, in going from place to place, that ought strictly to be used in mapping the country, and not the Fundamental or mean Ellipse. As far as there is any approach to analogy, Messrs. Adams and Le Verrier pursued precisely the same course which I have followed.

sure as I feel that Messrs. Adams and Le Verrier (to whom Mr. Tennant refers) never dreamt of ignoring the existence and attraction of that troublesome Planet, so clear does it appear to me that the Himmalayan attraction must not be trifled with and passed over.

2. It was to calculate this that my paper of 1855 was written. Other disturbing causes may exist, and should be estimated. But this cannot do away with the importance of estimating the effect of the Himmalayas. I have spared no pains to discover an antagonistic cause which would nullify the influence of the Himmalayas, but without effect. During the present year, I have forwarded to the Royal Society two other papers; one, estimating the effect of the deficiency of matter in the Ocean, which extends down from Hindostan to the South Pole; the other, the effect of any slight deficiency or excess in the density of mass of the earth prevailing over large spaces—such variations in density from the density of a fluid mass, under the same circumstances, as are not at all unlikely to have taken place in the crust of the earth in its becoming solid, or by expansions and contractions since that change occurred. The first of these disturbing causes we know exists, because the Ocean exists and is less than half as dense as rock. The amount of the effect is, however, uncertain because the depth of the Ocean is unknown. The result of the paper, therefore, shows the tendency and the nature of the effect, but not the exact amount.* The other calculation, viz. that of the effect of slight but wide-spread departures from the law of density in the interior mass, required by the fluid theory, was suggested by the hypothesis of Mr. Airy, that there might be a deficiency of matter below the Himmalayas which would, in a large degree, counteract their effect on stations on the Indian arc from Kaliana southwards. The result of this calculation is unfortunate; for it shows that such departures from the fluid-density as I have alluded to, and which may not improbably exist, will have a sensible and important effect on the plumb-line; *but* we have no possible means of becoming certain whether these variations of

* The attraction of the mountains and the deficiency of attraction of the Ocean are shown also to have a marked effect upon the sea-level, raising the level at Karachee many feet above the level at Cape Comorin.

density do exist or not. The uncertainty of the existence or not of this invisible enemy, and the utter impossibility (with our present knowledge) of ascertaining whether it does exist or not, and therefore whether our plumb-line is affected or not by some such invisible cause, is very troublesome—very far more so than the Himmalayas; because in their case there is a definite mass which it is possible to measure, and the attraction of which can be calculated. There is this to be said, that, as far as my investigations help me to make a comparison, the effect of the Himmalayas seems to be much more important, while it is more manageable, than any other of the probable causes of derangement. But, whether or not, the Himmalayas are a certainly-existing and a definite mass, and their effect ought to be calculated. The calculation is not so “voluminous” or tedious as Mr. Tennant seems to suppose—not near so toilsome as some of those in which his duties occupy him.* Were it not for the peculiar law of dissection made use of, no doubt it would have been an herculean work which any one might well shrink from. But this law reduces it simply to determining from the Survey Maps the average height of the neighbourhood of about ninety different places; multiplying them by the cosine of the azimuth, reducing the result to miles, and multiplying it by $1''.139$, which gives the deflection. In the parts beyond the range of the Survey Maps, and which have not so great an effect on the stations of the arc in question, an average form is obtained from Humboldt's observations and from other sources, and the calculation requires only the summation of a few simple arithmetical series. All the heights used are noted down in the Six Tables pages 78—83 of the paper of 1855; and upon a correction being given me of any one of the heights, I can (and any one who will examine the method can) in five minutes find how much the resulting deflection of the plumb-line must be altered—such is the simplicity which this law of dissection introduces.

* He observes that the effect of the mountains in Central and Southern India have not been considered. If Mr. Tennant will draw the lunes and compactments on a map as described in my paper and note down the heights and depressions of the several parts he will see that the effect will be too trifling to be taken notice of. This examination would not occupy him half an hour.

3. These calculations have been gone through again lately by a practised computer, working them under my direction by another course. The result is, that while the first calculation (of 1855) makes the deflections in the meridian at Kaliana, Kalianpur and Damargida to be $27''.853$, $11''.968$ and $6''.909$; this revised calculation makes them $27''.943$, $12''.047$ and $6''.790$. The differences are too trifling to be of any moment; and what variation there is rather aggravates the effect. All the separate errors in the first calculation, the aggregate of which has made this small discrepancy, have been detected, so as to make the two calculations exactly to tally. If there be, therefore, anything wrong in these results, it must arise solely from the heights being wrongly taken, or the density being wrongly assumed. The density used is that of the comparatively small rock Schehallien, and must be rather under the mark than over it; as that rock is but a few hundreds of feet high, whereas the most important part of the Himalaya mass is two miles high, and the lower parts must be denser, rather than lighter, from the pressure of the superincumbent weight. As to the heights, my own persuasion is, that, if anything, the most important heights are taken too small rather than too great.* But they are all written down in the six tables for inspection and criticism: and nothing can be easier than to point out which are too small and which too large. Any information of this kind forwarded to me I will immediately make use of, to correct the results—a work which will cost no labour and take but little time.

4. The calculations in the latter part of the paper of 1855 (after para. 47, p. 87) are more laborious: and here some numerical errors have crept in, one of which Mr. Tennant has pointed out, for which I thanked him in my former letter to you. These errors have no effect, however, upon the results of the paper. This part has, moreover, received a revise in my communications sent home last September. The result regarding the effect on the curvature of the Indian Arc will be modified—increased or diminished—accord-

*The Himalayas rise to more than five miles. But the greatest height I have taken in any one place falls a trifle short of two miles. The heights of *beds of rivers* above the level have been taken wherever they could be found, and not of the overhanging ridges and peaks.

ing to the existence, or not, and the character of, other co-operating disturbing causes.

5. The great importance of this subject in the problem of the Figure of the Earth—not the *average* figure of the *whole* earth, which has been sufficiently well determined, but of the separate parts—will be seen from the following facts:—

I.—Colonel Everest, in his large and valuable volume of 1847, assuming, as Mr. Tennant would do, that the Indian Arc is curved like the *average* ellipse of the earth; and ignoring, as Mr. Tennant would do, the effect of the Himmalayyas, brought out this result (see p. clxxviii of his Introduction), that by his geodetic computation Kuliana was farther north from Kulianpur by 1-10th of a mile than by the astronomical latitudes. He attributes this important discrepancy to mountain-attraction: but does not prove that mountain-attraction will produce this exact amount of error. My calculation shows that the effect of mountain-attraction is, not only to produce this amount, but a much greater amount, even three times as great: and the only way of making things tally is to assume that the form of the Indian meridian is *not* that of the *average* ellipse.

II.—If any one will turn to pp. lxx, lxxi of Colonel Everest's volume he will see the great care with which the amplitudes* of the arcs between Kaliaana and Kaliaanpur, and Kaliaanpur and Damargida, were observed. For example; for the first, 36 separate stars were observed and the average results taken. Of these separate observations 29 differed from the mean by less than 1" in excess or defect, 6 by less than 2" and one was $2\frac{1}{8}$ "; so near were the individuals to the mean value; and yet, to get an accurate result, 36 observations were thought necessary—showing that even a deviation of 1" was considered of importance. But Himmalayan attraction produces in this same amplitude (or difference of latitudes) an error of more than 15", and surely cannot be passed by.

III.—It is a fact palpable to the most ordinary observation, that the surface of the earth is not that of a perfect spheroid (or ellipsoid

* The *amplitude* of an arc of meridian is the difference between the latitudes of the two extremities of the arc.

of revolution,) and therefore its parts, at any rate near the surface, do not exert the same amount of attraction as if it were a spheroid. For example; mountains rise up on the North of India, and the Ocean spreads to the South. These, no doubt, we may *conceive* to be removed—the mountains to be pared down to the sea-level, and the density of the sea to be increased to that of rock. Were this done, the plumb-line might hang all right, in the true vertical or normal belonging to the surface of a spheroid. But since we cannot *actually* cut down the mountains, nor fill up the ocean, the plumb-line *will not* hang right for this purpose. If, therefore, we wish in imagination to remove the mountains and to fill up the ocean, we must do it by calculating their amount of influence, and allowing for this amount in our calculations. *Then* we may use the plumb-line, with this correction, as the true vertical or normal to an elliptic surface, but not before.

6. My object in writing these papers has not been to detect and expose flaws in the operations of the Great Trigonometrical Survey—very far from it; but to assist in pointing out the sources of error, and the further observations and surveys which are necessary to remedy the evils which must inevitably follow if these sources of error are not attended to. The elaborate and well-executed survey must be utterly useless in determining with accuracy the curvature of the Indian Continent, and therefore of mapping the country with high scientific nicety, unless this is done. Except to suggest a remedy in so important a work, after my attention had been called to it in 1852 by the present Surveyor General, I could never have devoted the time which has been necessarily occupied on this highly interesting subject, even with the relief which the assistance of a practised computer has afforded. The difference in the views which Mr. Tennant and I take of the subject must arise from some misconception which I am unable to fathom.

J. H. PRATT.

Calcutta, November 9th, 1858.

P. S.—Since the above was written, Colonel R. Strachey has favoured me with some information regarding heights in Tibet. I have given the results of these new data in a third paper to the Royal Society. They do not at all meet the difficulty.

Fragments of three early Hindu dramatists, Bhāsa, Rāmīla, and Somīla.—By FIRZ-EDWARD HALL, M. A.

Elsewhere I have stated my belief that these are the poets who are named, with implied eulogy, near the opening of the *Mālavikāgnimitra*.* Bhāsa should seem to be also called by the longer name of Bhāsaka; and it may be doubtful, owing to the variations of manuscripts, whether Somīla be orthographical, or Saumīla. That the author of the *Mālavikāgnimitra*, to whom these poets were of course antecedent, is the Kālidāsa of Vikramāditya is, perhaps, questionable. Yet, whoever he is, he belongs to a respectable antiquity: and such are his own merits that his encomium would scarcely be expected of any competitors but such as once enjoyed considerable repute. In the ensuing verses we have all the remains of these three play-writers that appear to have reached the present time. For these few lines we are indebted to the *S'ārngadhara-paddhati*, of which work I have collated several excellent and somewhat venerable copies. I commence with the relics of Bhāsa, whose era may be carried back, with positiveness, to the seventh century, at the least.† Supplials, in the translations, are indicated by italics.

अस्या ललाटे रचिता सखीभिर्
विभाव्यते चन्दनपत्रलेखा

* Preface to the *Vāsavadattā*, pp. 14 and 15, foot-note: also pp. 20 and 21, foot-note.

† See the preface to the *Vāsavadattā* as by the last note. Bāna, in the *Harsha-charita*, speaks of Bhāsa. He is also extolled by Rājasékharā. But Rājasékharā's age is still to be precisely determined. It is certain that he was not very ancient. The *Jagaj-jīva-vrajyā* of Jayadeva, cited in the sixth chapter of the *Padya-venī*, a poetical anthology by Venidatta, son of Jagajjīvana, whimsically characterises Bhāsa, with Chora, Mayūra, Kālidāsa, Harsha, and Bāna:

यस्याखरश्चिकुरनिकरः कर्णपूरो मयूरो
भासो हासः कविकुलगुरुः कालिदासो विलासः ।
हर्षो हर्षो हृदयवसतिः पद्मबाणस्तु बाणः
केषां नैषा कथय कविता कामिनी कौतुकाय ॥

आपाण्डुरक्षामकपोलभित्ता-

वनङ्गबाणव्रणपट्टिकेव ॥ *

‘Beauteous show the decorative lines of sandal traced on her brow by her attendants; and so the marks,—as it were plasters over wounds from Cupid’s shafts,—on the tract of her pale thin cheeks.’

दयिताबाहुपाशस्य कुतोऽयमपरो विधिः ।

जीवयत्यर्पितः कण्ठे मारयत्यपवर्जितः ॥ †

‘How different, in operation, from other nooses, is the noose of a sweetheart’s arms! Fastened about the neck, it imparts life; loosened, it produces death.’

कपाले मार्जारी पय इति करान् लेढि शशिनस्

तखण्डिद्रोतान् विसमिति करो सङ्कलयति ।

रतान्ते तल्पस्थान् हरति वनिताऽप्यंशुकमिति

प्रभामत्तश्चन्द्रो जगदिदमहो विङ्कलयति ॥ ‡

‘The cat laps the moonbeams in the bowl of water, thinking them to be milk. The elephant imagines that the moonbeams piercing through the intervals in the foliage of the trees, are esculent stalks of the water-lily. The mistress, again, after dallying, grasps at the moonbeams lying on the bed, taking them for her garments. Oh! the moon, intoxicated with radiance, bewilders the whole world.’

तीक्ष्णं रविस्तपति नीच इवाऽचिराद् यः §

शृङ्गं रुरुस्त्यजति मित्रमिवाऽहतज्ञः ।

तोयं प्रसीदति मुनेरिव कर्मचिन्ता

कामी दरिद्र इव शेषमुपैति पङ्कः ॥ ||

* This Stanza is in an *upajāti* measure consisting of alternate *Indravajrás* and *Upendravajrás*. Such a metre is denominated *Smṛiti*.

† *Vaktra*.

‡ *S'ikharinī*.

§ Query अचिराय?—Ebs.

|| *Vasantatilaká*.

‘The sun, like the vile, keenly annoys for a brief season. The deer casts his horns, as the ungrateful man *forsakes* a friend. Water becomes serene, as does the thought of active duties to the holy sage. The moist soil dries up, as does the wretched lover.’

Rámila and Somila, wherever they have been found mentioned, are mentioned in conjunction; the Beaumont and Fletcher, perhaps, of the classical Indian theatre. Only a single stanza of theirs is accessible to me.

सव्याधेः छगता चतस्र रुधिरं दृष्ट्य लालास्रुतिः
किञ्चिन् नैतदिहास्ति तत् कथमसौ पान्यस्तपस्वी मृतः ।
आज्ञातं मधुलम्पटैर्मधुकरैरारब्धकोलाहले
नूनं साहसिकेन चूतमुकुले दृष्टिः समारोपिता ॥*

‘In one who has been ill, there is emaciation; when one is wounded, *effusion of blood*; and, in the case of a person bitten by a *venomous animal*, flow of saliva. There is nothing, however, of these in this instance. How, then, did the wandering *self-styled* ascetic die? Indeed, it is surmised that the rash man cast his eyes on the opening buds of the mango-tree, newly resonant with bees transported with aroma: *and so he perished.*’

The spring-time is here suggested. The general purport of the stanza is, that the memory of the poor devotee, a mere neophyte, was carried back, by the humming of the bees, to other and more genial circumstances; that the reminiscence was too much for his acute sensibility; and that the shock deprived him of existence. Kálidása himself would not have been disgraced by this conceit.

* *S’árdúlavikrídita.*

On the Swayamvara of the Ancient Hindús, and its traces in the ancient world generally.—By E. B. COWELL, M. A.

One of the favourite incidents in the heroic poems of the Hindús is the rite called *Swayamvara* or the choice of a husband by a princess from an assembly of suitors met from all parts to take their chance in the lottery. Success is not represented as depending on their own efforts, as in many of our fairy tales, where the knight wins the lady by his own prowess in a tournament; the heroes here submit themselves in silent rivalry to the princess's inspection as she walks along their line, and selects from the throng the favoured suitor by presenting him with a garland, or a cup of water, or some such token of regard. The readers of Hindú poetry will at once remember many instances of this peculiar institution, which must have been not uncommon in actual life as well as in the ideal world of the heroic times, since we find it apparently alluded to in the following passage in Arrian's *Indica*. "The Indians neither give nor receive gifts when they marry, but when their daughters are of a marriageable age, their fathers bring them out publicly, and set them as the prize for the winner in a wrestling or boxing or running match, or any such manly exercise." This hardly corresponds with the practice as we find it described in Hindú literature, since Arrian represents the lady as acting a merely passive part, whereas, if we may judge by the poems and by the very name *Swayamvara* (from "*Swayam*" "herself," and *vara*, "choosing,") she had a much more active share in the transaction.* Dean Milman

* The custom is not found among the various forms of marriage given in Manu's third book, but this may be explained by the fact that the *Swayamvara* relates only to the choice of the husband, the nuptial ceremony being performed afterwards according to the proper rites. We find an allusion in a later part of the *Institutes* which proves the prevalence of the custom, as it is said (ix. 90, 91), "three years let a damsel wait, though she be marriageable; but, after that term, let her choose for herself (*vindeta*,) a bridegroom of equal rank; if, not being given in marriage, she choose her bridegroom (*adhigachhed yadi swayam*,) neither she nor the youth chosen commits any offence." The Scholiast explains it of the so-called *Swayamvara*, "*adhikagunavarálábhe samánajátiguṇam varam swayam vrínáta*."

has, to a certain extent, familiarised the English reader with the custom by his spirited translation of the scene in *Nala*, where Damayantí, the princess of Vidarbha (Berár), chooses the prince of Nishadha from the assembly of mingled gods and men.

“ On the gods an instant gazed she—then upon the king of men ;
And of right king Bhima’s daughter named Nishadha’s king her lord.
Modestly the large-eyed maiden lifted up his garment’s hem,
Round his shoulders threw she lightly the bright zone of radiant flowers.”

The Swayamvara of the sister of king Bhoja forms one of the most beautiful episodes in the *Raghuvans’a*, of which we may ere long hope for an English translation from Professor Griffith, already so favourably known as the translator of the *Kumára Sambhava*, or “ the birth of the Wargod.” Similar scenes occur in almost every Hindú poem ; in fact a Swayamvara is nearly as much an established ingredient in Sanskrit epics, as a catalogue of ships or heroes is in those of the west. We need only mention here those in the *Naishadha* and the *Mahábhárata* ; in the latter, besides that of *Nala*, translated by Dean Milman, we have that of *Draupadi*, translated by Professor Wilson. Nay, the rite was so popular with the poets that it is even made current in the life of the gods ; and the Swayamvara of *Lakshmí* forms the subject of the drama, which *Urvási* is acting before *Indra* with her sister nymphs, when she loses her presence of mind and lets a mortal’s name escape from her lips.

In the following pages, I have collected from classical writers some of the more remarkable instances of the prevalence of this custom in other parts of the ancient world as well as India ; we shall find traces of its presence in widely different climates, Greece, Gaul and ancient Persia ; and in the last case, it may lead to an important and, I believe, hitherto unnoticed corroboration, from a Greek author, of one of the fine old traditions in *Firdausi’s Sháhnámeh*.

The first instance is one which the classical student will easily recall in the 6th book of *Herodotus*, where he discusses the rise of the family of the *Alcmæonidæ*, and its great increase of wealth and power by the marriage of *Megacles* with the daughter of *Cleisthenes*, the tyrant of *Sicyon*. This marriage is described as a true Sway-

amvara ; Herodotus' account reads like an episode of some ancient poem, when he represents the various princes and nobles flocking as suitors to the court from the chief cities of the Grecian world. The historian tells the account in his very best manner, how the favoured suitor Hippocleides at last grew presumptuous with success and "danced away" his fortune by his thoughtless frolic, and gave birth to the current proverb, *ὁν φροντὶς ἱπποκλείδῃ*, while the young Athenian carried off the bride, and their descendant in the third generation was Pericles.

Another instance occurs in Justin's narrative of the founding of the city of Marseilles. A colony of Phocæans, under the leadership of Simos and Protis, landed in Gaul near the mouth of the Rhone. On their repairing to the court of Nannus, the king of the tribe, in whose territory they wished to settle, they found him, as it chanced, engaged in the ceremony of his daughter's marriage, whom he was preparing to deliver, *more gentis*, to the bridegroom whom she might select at a banquet. All the invited guests came as suitors, and among the rest the Greek strangers were invited to attend. At a given moment the maiden is introduced into the assembly, and her father bids her hand water to the man of her choice ; when forthwith, unheeding the others, she turns to the Greeks, and holds out the cup to Protis. The fortunate adventurer thus became the king's son-in-law, and founded Marseilles, where his memory was probably honoured as a patron hero. Athenæus tells the same story, on the authority of a lost work of Aristotle ; and adds that there was still a family in Marseilles called Protiadæ from their founder.*

But the most interesting of all these parallels is one which Athenæus has given us in the same place as a quotation from the tenth book of the history of Alexander (*τῶν ἱστοριῶν τῶν περὶ Ἀλέξανδρον*) by Chares of Mytilene. In itself, the narrative wears a peculiarly striking character, all the more so from its entire disconnection with any context, as almost every other line of Chares has perished ; and the actors of the scene appear and vanish abruptly, without our

* Cf. Justin, xliii. 4 ; Athenæus xiii. § 36. Aristotle represents the founder's name as Euxenus, and Protis as his son by the marriage ; but this is only one of those ever-recurring uncertainties in the "dissolving views" of legendary, as distinguished from authentic, history.

being able, from *classic* sources, to identify their persons or times. We give it in the historian's words.

“ Zariadres was the younger brother of Hystaspes, and both were fair, and the people say of them that they were born of Venus and Adonis. Hystaspes ruled over Media and the region below it, and Zariadres over the country above the Caspian gates as far as the Tanais. Now Omartes, the king of the Marathi, a tribe beyond the Tanais, had a daughter named Odatis; and of her runs a legend that she once saw Zariadres in a dream and fell in love with him, and the same thing likewise happened with him towards her. For some time they continued thus, loving each other from the image in the dream. Now Odatis was the fairest of all the women in Asia, and Zariadres too was fair; but on his asking her in marriage of her father, Omartes would not consent, as he had no male child, and he wished to marry her to some one of his own people. And not long after, Omartes summoned all the nobles of his kingdom and all his friends and relations, and made a marriage feast, but told no one who it was that should marry his daughter. At length when the feast was at its height, he called Odatis into the banquet-hall, and said to her in the hearing of all the guests, ‘ Oh my daughter Odatis, we are now making thy marriage feast; look round therefore on the guests and view them all, and take a golden cup and fill it, and give it to him whom thou chooseth as thy husband; for his wife shalt thou be.’ And she then, looking round upon all, walked sadly away, longing to see Zariadres; for she had previously sent a message to him, how that her marriage was about to be solemnised. Now he chanced at the time to be encamped by the Tanais, and immediately on hearing it, he left the army secretly and crossed with only his charioteer; and mounting his chariot by night, came riding through the city, having driven more than 800 stadia. As he drew near the festal place where they were holding the marriage, he left his attendant with the chariot hard by, and marched boldly in, having put on a Scythian dress. On his entering the hall, he beheld Odatis standing before the sideboard, and weeping bitterly as she slowly filled the cup; and standing close by her, he said in a low voice, ‘ O Odatis, I am come as thou badest, I thy Zariadres.’ And she, turning round, beheld the stranger, fair to the

eye and like to him whom she had seen in the dream, and overjoyed she gave to him the cup; and he, seizing her in his arms, bore her away to his chariot and fled. And the servants and handmaidens, who knew of their love, stood silent, and when her father charged them to speak, they said that they knew not whither she was gone. And this story of their love is known among all the barbarians who dwell in Asia, and greatly indeed do they prize it, and they sculpture it upon their temples and palaces, aye and even in their private houses; and many of the nobles call their daughters Odatis after her."

Firdausi's great national epic is a Mausoleum in which he has embalmed all his country's ancient heroes, and inscribed all the old names associated with her days of independence, before her glories succumbed to Islam at Cadesia. He tells us that he collected his materials from the legends which he found floating amongst the *Dihkâns* or landed proprietors* of Persia, more especially in the remoter provinces. He thus gathered together the fragments of "Border Minstrelsy," and incorporated them in his own great poem, which, far from being a mere tissue of his own inventions, like Ariosto's Orlando, was meant to be a faithful monument of all that was remembered of Persia's heroic times.

That his work contains so little that is available for historical researches, arises from various causes, but there is no need to increase their number by supposing wanton infidelity to his trust on the part of the poet. So few of the Greek writers on Oriental subjects are preserved, that we have hardly any means left us to test

* "Les Dihkans formaient une classe de l'ancienne noblesse persane. Ils étaient selon la définition qu'en donne le *Modjmel-al-Tewarikh*, "des chefs, des propriétaires de terres et de villages," et formaient une aristocratie territoriale qui retint, même sous le gouvernement des arabes, son influence locale..... Leur condition sous le khalifat devait être à peu près la même que celle des familles saxonnes de l'Angleterre qui gardèrent leurs propriétés sous les Normands, et à qui leur influence héréditaire tient encore aujourd'hui lieu de titres de noblesse [*country families*]." M. Mohl's preface to his edition of the *Sháhnámeh*, vol. i. p. viii. The position of the dihkâns is a most important link in the chain that connects the present reminiscences of Persia with her own earlier times. Their authority is quoted in every part of the *Sháhnámeh*.

these legends; and the very form in which we have them has been doubtless subjected to continual changes, as they floated on the lips of successive generations, ere they were stamped by Firdausi (A. D. 1000) into their present permanent shape. As it is, they bear all the marks of a legendary age,—deficient in everything but spirit and imagination,—and it is hopeless to construct a system from their chaos. Still such a system might have been partly possible, had Ctesias and Chares been preserved to us,—many a legend which now lies buried under its surrounding inventions, would have started into a new significance, if we could have compared it with some Greek account, which had preserved the true lineaments of the story.

The legend of Odatis, which has been casually saved by Athénæus' quotation from Chares, is a single specimen,—we have nothing else of the kind; but this legend is at once to be recognised in the *Sháhnámeh*; and the striking confirmation thus presented makes us realise how much we have lost in the wreck of Greek Oriental history.

Lohrásp, the king of Persia, had irritated his son Gushtásp by his excessive partiality for his children by another wife. Gushtásp in despair first fled towards India, but is followed by his uterine brother Zarír (Zariadres,) who persuades him to return to his father's court. He is, however, again provoked to fly, and he now bends his course to Rúm. On arriving at the capital, he in vain seeks for employment in the court, and, failing this, in the bazar; and he is well nigh reduced to desperation, when a Dihkán, in a neighbouring village, takes pity on his forlorn condition, and lodges him as a guest in his house. Of the remainder of the story we add a literal version, line for line with the original as given in Macan's edition, vol. ii. pp. 1038—1040.

The Kaiser of Rúm cast about in his mind,
That, since his daughter was now of age,
Her star of fortune high, and she ripe for marriage,
It was time that she were given to a husband.
He would gather an assembly in his palace
Of all his wise nobles and counsellors,

There should meet together all his peers,
And his men of renown, lofty of stature.
In her father's palace that moon-faced maiden
Was to wander through that assembly, seeking a husband,
And her maidens were to stand round her in a ring,
That no man might see her lofty crown.
Now at that time behind the Kaisar's pardah,
Were three daughters like roses in spring,
Fair in stature and countenance and gentle manners,
Fair too in judgment, modesty and virtue.
The eldest of them all was Kitáyún by name,
And wise was she, bright-hearted and happy.
And one night Kitáyún had seen a dream,—
She had seen a landscape bright with sunshine,
And a band of chieftains had appeared in her sight
In a bright cluster like the Pleiades ;
And amidst them all was a stranger,
A gallant exile desolate-hearted,
His stature a cypress, his face like the moon,
And he sat as a king sits on his throne.
And Kitáyún, in her dream, gave him a garland,
And she took from him another, full of colours and scents, in
return.

In the morning when the sun came forth,
The nobles all awoke from their slumbers,
And the Kaisar called a great assembly together,
None of great or puissant but was there ;
Glad they hastened to the assembly,
And they called the peri-faced princess in.
With her sixty handmaidens came Kitáyún,
A bunch of fresh narcissuses in her hand,
And she walked along until sadness came over her,
For not in that assembly was the man of her choice.
And she turned from the hall and went back to her chamber,
Walking slowly and weeping and with a longing heart.
Then the earth became black like a raven's wing,
Till the sun again lifted his head from the mountains.

Then the Kaiser commanded that from the men of low degree
To the men of highest wealth and birth in Rúm,
All should come with one mind to the palace,
If among them might be found one whom the princess approved.
When the news spread through the city,
To the nobles and high and low,
All turned their faces to the palace of the king,
Each, in his hope, full of colours and perfume.
And the good Dihkán said to Gushtásp,
“How long sittest thou hidden in thy cell?
“Come, for if thou seest the palace and its pomp,
“Perchance thy heart may lose its burden of grief.”
When Gushtásp heard this, he rose and went with him,
And he hastened to the palace of the king;
And he crept to a corner, away from the great men,
And sat him down, full of grief and with a wounded soul.
The attendants came forth with watchful hearts,
Kitáyún and her rose-cheeked handmaidens,
And she slowly walked round her father’s hall,
Her wise men behind her and her maidens before.
When from afar she beheld Gushtásp,
She exclaimed, “My dream has lifted its head from darkness!”
And she decked the head of the gallant youth
That same moment with her royal crown.
When the wise vizier beheld her deed,
At once he ran before the Kaiser,
“She hath chosen a man from out the crowd,
“In height like a tall cypress in the garden,
“With a cheek like a rosegarden, and broad shoulders,—
“All who look on him are lost in wonder.
“Thou would’st say, ‘he was the strength of the Almighty!’
“But I know him not, who he is.”
Him answered the king, “God forbid that my daughter
“Should bring shame from behind the curtain on her race.
“If I give my daughter to a fellow like this.
“My head will lie down in dishonour.
“Go take her, and him too whom she hath chosen,

“And their heads shall be smitten off in the palace.”
The vizier replied, “This is no such direful matter ;
“Many a noble hath done thus before thee.
“Thou badest thy daughter choose a husband,
“Thou said’st not that she was to choose none but a king.
“She sought for one who might please her heart ;
“Turn not then thy face from the path of God.
“Such hath been the custom of thy ancestors,
“Those proud and righteous pure ones ;
“By this law hath Rúm been established on its base ;
“Wander not thou in a desert land.*
“Thy words are unblessed, utter them not,
“And stray not in a path untrodden by thee before.”
When the Kaisar heard his words, he made his resolve
To give his peerless daughter to Gushtásp,
But he said to her, “Go with him such as thou art,
“Never shalt thou have treasure or crown or signet from me.”
When Gushtásp beheld this, he marvelled greatly,
And he called to witness the Maker of the world.
Then he turned and spake to the royal maiden,
“Oh thou brought up in softness and delicacy,
With a rank so lofty and a crown thine own,
Why hath thine heart chosen such as me ?
Thou hast chosen an outcast, and with him no treasure
Shalt thou find, but thou must pine with him in sorrow.
Oh seek thine equal among these nobles,
That thy face may yet be bright before thy father.”
Kitáyún made answer, “Oh jealous one,
“Vex not thyself with the decrees of heaven ;
“Since I am content with thee as my husband,
“Why seek’st thou crown, or sceptre or throne ?”
Then sadly walked out of the Kaisar’s hall
Kitáyún and Gushtásp with many a sigh,
And they came to the house of the Dihkán,
And sat them down shrinking and sad.

* Literally “in the land of the owl.”

We need hardly stay to dwell at length on the many points of coincidence between the legend of Chares and this of Firdausi. Gushtásp, Zarír, the dream, the Swayamvara and its denouement are at once prominent in both, and point unmistakeably to a common source. The very differences are not without a meaning; the Persian recension has naturally linked the tale to its national hero, Gushtásp, in preference to the less famed brother, Zarír; and instead of the Tanais and the Marathi, we have the more familiar Rúm of Firdāusi's own time. But the peculiar features of the ancient story remain unchanged amidst the fluctuations of time and place; it is still the old legend which was "known among all the dwellers of Asia" and "sculptured on their temples and palaces." Chares of Mytilene hands it to the grammarian of Alexandria, who preserves it through the dark ages in the west; while in its own land it lives in the memories of the people, (*volitat vivu' per ora virúm,*) through all the changes of Arsacidæ, Sasanidæ and Mohammedans, until Firdausi arises under Mahmúd of Ghazni, and stereotypes it from the lips of the Dihkâns of his day.

Report on Geological Specimens from the Persian Gulf collected by Lieut. C. G. Constable, I. N.—By H. J. CARTER, Esq., Bombay.

This Report has, so far as the Persian Gulf is concerned, been drawn up partly on Geographical, and entirely on Geological, data specimens and sketches furnished by Lieut. C. G. Constable, I. N., who, assisted by Lieut. A. W. Stiffe, also of the I. N., has been, and still is, employed in surveying parts of the Gulf; and in whose accuracy I have reason from actual experience, to place every confidence.

Geography.—Sailing northwards from Muscat, we observe that the great chain of mountains behind the town known by the name of Jibel Akdthur, or the “Green Mountains,” is continued on to Ras Mussundum, which forms the western promontory of the Persian Gulf, where they suddenly sink to an altitude of 400 feet, while not more than thirty miles further back there is a point 6,700 feet high. The Straits themselves are also about thirty miles broad, and on the opposite side the land slopes into the sea with a more or less even shore and without promontory for a considerable distance north and south, forming a strong contrast with the intensely fretted out and rocky termination of the chain on the Arabian side. Striking, however, as the contrast is at these two points, there are two mountains within sight of Ras Mussundum on the opposite coast, which are respectively 8,500 and 5 to 6,000 feet above the level of the sea; the first, which is Jibel Shemeel, is about 70 miles northward, and the other, called Jibel Bees, about 60 miles eastward. These, then must be regarded as the two pillars of the Straits on the eastern or Asiatic side.

Again, from the Straits westwards, if we trace the shores of the Gulf, it will be observed, that while the north-eastern side is bordered by the mountainous chain of which Jibel Shemeel forms a part and which continued on north-westwards up into Khour-distan, borders the Mesopotamian valley under the name of the Khourd Mountain, the south-western or Arabian side is, with the exception of a low hill here and there, only a few feet above the level of the sea, from the western promontory of the Straits

up to the town of Kouett at the top of the Gulf, and even far beyond this into the plains of Mesopotamia.

Lastly, turning our attention to the Persian Gulf itself, we find that although the bottom is, as a matter of course, more or less uneven, yet that it shallows generally, from the great fault marked by the chain of mountains on the north-eastern side on towards the Arabian coast. Hence the deep water, which nowhere exceeds 50 fathoms, is all on the Persian side, while a greater part of that on the south-western half of the Gulf, especially where the great Pearl Banks are situated, is not more than 10 fathoms deep.

The principal Islands, too, are all on the Persian side and towards the mouth of the Gulf, while those which are in the south-western half are, with the exception of Bahrein, almost all insignificant, either from their little size or low altitude.

Geology.—On entering the Gulf, Lieut. Constable's specimens from Ras Mussundum show that this promontory and the mountains about it, are chiefly composed of a more or less fine, compact, lead-blue passing into black, limestone, which in some parts is fossiliferous, as the remains of a large *Pecten* attached to some of the specimens proves.

Passing further in we come to the islands of Larrack and Hormuz, which are twelve miles apart, and the former about twenty-six miles north of Ras Mussundum. Larrack is 400, and Hormuz 700 feet high. From Larrack we have specular iron-ore as its characteristic; and from Hormuz, rocksalt, sulphur, gypsum, specular iron-ore, and pyrites. Hormuz is described as consisting of a plane of salt-rocks about 50 feet above the level of the sea, out of which rise several white peaks which attain the altitude mentioned. Around these the salt-rocks present a dreary waste of ridges and ravines covered with a soft red earth, which has been eliminated from their interstices by deliquescence of the salt during the moist and rainy weather. The white peaks, on the other hand, are composed of a greenish-white jasperous rock, like an ill-formed or decomposing diorite, charged with nodules of pyrites and intensely impregnated with salt; this rock looks like a pseudo-trap diorite, that is, a trap-diorite which has accidentally become mixed with stratified deposits during its fluidity.

Passing on to the island of Kishm, which is within ten miles of Hormuz, and the largest by far in the Persian Gulf, being about 55 miles long, but very narrow; the specimens and descriptions of this island show that it presents the same kinds of rocks as those of Hormuz and Larrack, but in addition to these there is a stratified sedimentary formation upon it of great extent, and upwards of 500 feet in thickness.

The latter is particularly well seen about the town of Kishm, which is situated at the eastern end of the island, in long inclines terminating in bluff precipices, some of which are 570 feet high. Again at Bassadore, which is situated at the opposite or western end of the island, it is equally well seen in the form of flat-topped precipitous elevations called the "Great" and "Little Hummucks," of which the former is 500 feet high.

This formation consists of upwards of 500 feet of calcareous clay, capped by from 30 to 40 feet of a more or less coarse, and more or less consolidated, detritus of shells and calcareous grit.

The clay is of a light grey colour, very fine consistence, effervesces violently with acids, and is veined throughout with fibrous gypsum. It is also very plastic, and is used extensively in Kishm for pottery. Some portions bear impressions of bivalves, but those which I have are too imperfect for description.

The detritus of shells, again, may be coarse or fine to almost chalky. The shells are semifossilized, easily separated from the mass in which they are imbedded, and bear such a resemblance to those of the present day that they appear to be the last raised from the bottom and sides of the Gulf. Whether this formation is conformable to the clay beneath, and whether the two belong to the same, or to two different geological epochs, further observation must determine.

Thirteen miles from Bassadore on the same island, are "the Salt Caverns" where a green trap-diorite is found, specular iron-ore, sulphur, &c. as at the islands of Larrack and Hormuz, and these volcanic products, as well as the sedimentary formation, we shall presently see, are also extended to the mainland or coast opposite.

After the island of Kishm, we come to the great and Little Tombs, Polior Nobflure and Surree; the furthest not more than 55, and the nearest only 15 miles from the western end of Kishm; and here

again in each, we have most of the characters of the foregoing islands, viz., green trap-diorite, specular iron-ore, gypsum, salt, sulphur, &c., as well as a white calcareous grit containing semi-fossilized shells, similar to that which caps the clay on the island of Kishm, but the clay appears to be absent. Here the calcareous deposit is identical with that which I have called "Milliolite," on the south-east coast of Arabia and with that "free-stone" from Khattiarwar imported at Bombay under the name of "Porebunder Stone." That from Polior and the Great and Little Tombs contains a large cancellated *Lucina*, characteristic of the same formation at Morbat on the south-east coast of Arabia; also *Tridacna*, *Avicula margaritifera*, or the common Pearl-Oyster, *Fistulana*, a small *Echinus*, Corals, &c.

From the island of Aboo Moosa, a little to the south of the latter, the characteristic specimens are again the "Milliolite" resting on the veined clay; and there is a compact yellow limestone peak probably of Eocene age which rises to 370 feet above the level of the sea; but there are no volcanic products here.

Going back to the Persian side of the Gulf, we have again the "Milliolite" characterizing the islands of Kais, Hindi Arabi and Monakeyla, all situated very near the shore; but no longer any volcanic products in either.

Lastly, we arrive at the islands of Karrack and Khago, which are close together, and about 35 miles north-west of Bushire. Karrack presents the same kind of sedimentary formation as that of the island of Kishm; but here the clay is changed for a very fine laminated sandy deposit with little scales of mica, capped, however, as usual with the coarse shelly deposit.

The rock from Khago is a calcareous gravelly "Milliolite," composed chiefly of rounded pieces of shells firmly consolidated. The same kind of rock also forms the islets of Hargooz, Farsee, Arabi, and El Kran, which are situated near together more towards the Arabian side of the Gulf, about 80 miles south of Karrack.

Returning to the Persian side, on the mainland opposite Bassadore is a sulphur mine, which is much worked by the Arabs, and about 20 miles further on is the town of Linga, close to which are hills of fine diorite like that near Muscat; and a little to the west of these, we come again upon the sedimentary formation first seen at Kishm,

which is here raised up into a hill 330 feet high, and on the top of which is the fort of Kalah Leshtan. As at Kishm, 30 feet of the top consist of a coarse, shelly detritus, and the 300 feet below of clay thickly veined with fibrous gypsum. Still further on, at Jilla el-Abed, which is opposite the island of Khais, we have trap-diorite again and specular iron-ore with rock salt.

Beyond this, at Assaloo, we have the characteristic gypseous formations of the coast, viz. earthy and massive white, crypto-crystalline gypsum; and at Tahree again, we meet with the "Milliolite," sloping up from the shore a little distance from the sea, so as to form an inclined plane with a scarp behind, in which an innumerable quantity of troughs of different lengths have been cut at right angles to the inclination, and which, from the number of wells present, would appear at some remote period to have been used as a garden, perhaps for supplying the town, which now lies in extensive ruins a little distance off on the shore; there are also holes in the precipitous parts of this incline, where it has been cut through by ravines, which appear to have been used for sepulchral purposes; but Lieut. Constable, who has a full description of the whole, will one day, I trust, lay his interesting account of this locality before the public.

Lastly, at Bushire we have the same kind of fine sandy deposit capped by shell-detritus or shell-concrete as that of Karrack, indicating that the nearer we get to the Shat el Arab, from which the whole has probably been derived, the coarser the sediment becomes, while the further off we go, as at Kishm, the more subtle it is. At Bushire there also appears to be a still more modern shell-concrete.

Observations.—Hence we learn that there are two striking geological features at least in the Persian Gulf. One the presence of a sedimentary formation of more than 500 feet thickness, which has been raised above the level of the sea; and the other, the existence of a volcanic area, including all the islands at the eastern end of the Gulf and part of the mainland, which is characterized by the presence of trap-diorite and a great development of rock-salt, gypsum, sulphur, pyrites, specular iron-ore, &c.

The type of the sedimentary deposit we have found to be upwards of 500 feet of fine calcareous clay veined with fibrous gypsum, and

capped by 20 to 30 feet of a calcareous, shelly grit more or less coarse, more or less chalky in consistence, and in which the shells are semi-fossilized or semi-lapidified. Whether these two distinct deposits are conformable to each other or not I am ignorant, but the sketches of them which I possess are in favour of the former; at the same time, although conformable, they may contain fossils of different geological epochs, which would prevent their being grouped together. Unquestionably the calcareous shelly grit of Kishm is identical with the same formation, slightly modified, in the other parts of the Gulf, and which modification identifies it with the same deposit on the south-east coast of Arabia and that on the outer or western coast of Khattywar in India, which I have termed "Milliolite," and assigned provisionally to the Miocene era. Provisionally, therefore, it might be as well to consider that of the Persian Gulf together with the clay, also Miocene.

Another interesting point then presents itself, viz.—When were the volcanic islands of the Gulf raised above the sea? And this seems to be answered by the position of the Miocene formation at the island of Kishm, which, resting upon these rocks, and being capped with a material which must have been deposited at the bottom of the sea, proves that the elevation of these islands, or this volcanic out-burst, took place after the Miocene period, and was the last great convulsive displacement to which the earth, under and about the Persian Gulf, has been exposed; for there has not been any other subsequent sedimentary deposit of any consequence raised above, or probably deposited in, the sea of the Persian Gulf since that period.

Having arrived so far then, we may with profit, perhaps, trace this volcanic agency a little further, and first following the Mekran coast on to Kurrachee, we find an extensive area in the province of Luss, where this disturbance is still in great activity; not, however, pouring forth fire and lava, but sulphurous gas and water, which, bubbling through a clay deposit of great thickness, has thus formed mud-mountains and mud-craters over an area between the highland of the interior and the sea which occupies the greater part of this province. Moreover, the very same kind of sedimentary formation, equally broken up too as that on the island of Kishm, characterizes

this area towards the sea, and from thence, as I have stated in my "Summary of the Geology of India," is continued on into Lower Sind.

But what struck me forcibly in the portions of mud from these mud-volcanoes, which were sent to the Society by Mr. H. B. Frere, Commissioner in Sind, was the presence of calcareous matter mixed with sulphur and passing into gypsum or sulphate of lime,—connected with the great development of impure rock gypsum (that is gypsum veining an aluminous, earthy, consolidated base, which, from Lieut. Constable's specimen, appears to exist throughout the sub-range of mountains between the highland and the sea all along the north-eastern side of the Persian Gulf, indicating that this has been formed in a similar way, and that the process above described is going on now and has existed for ages.

Now carrying our speculation out a little further, and going to the upper end of the Gulf, we may reasonably infer that as the same range of mountains bordering the north-eastern Coast of the Persian Gulf is continued on into Persia, and up into Khourdistan under the name of the Khourid Mountains, forming the north-eastern boundary of the vale of Mesopotamia, in which springs of asphalt abound,—the same source of subterranean disturbance, (probably a carboniferous deposit mixed with pyrites) exists throughout; and finds its different outlets all along the great crack or fault in the earth, which must accompany the precipitous or south-western face of this highland tract.

Furthermore, it is not improbable that the so called "marbles" of Nimroud and of all the great cities which have existed in this vale that have been brought to light, and which are chiefly composed of mottled impure rock-gypsum, precisely like that of the hills on the shores of the Persian Gulf, have been obtained from quarries in the sub-ranges of the Khourid Mountains. Lastly, might it not have been the outburst of volcanic matter which we now know to have been that which threw up the Miocene formation of the Persian Gulf, and the last upheaval, apparently, of any consequence in this sea, that caused the disturbance of level in the vale of Mesopotamia, which led to the overflowing of these cities with the mud under which they now lie buried and thus concealed from view.

Perhaps in no part of the world could the phenomena connected

with the formation of rock-salt, rock-gypsum, sulphur-pyrites, and specular iron-ore, be studied with such ease, certainty and success, as along the sub-ranges of mountains which extend from Mekran up into Khourdistan.

Of the formation composing the highland I can only infer, as the scarps are said to present a white aspect, that it is capped by the eocene limestone, which forms part of it when extended into Arabia on one side and into Beloochistan and Sind on the other.

Memorandum on Education in China drawn up from information afforded by the Ex-Imperial Commissioner Yeh.—By C. ALABASTER, Esquire.

Education in China is so much influenced by the direct as well as indirect patronage of the State as to be there rather a Government than, as in most other countries, a public institution; not only does Government in great measure support it by the establishment of free Schools at every official station in the Empire, but, by keeping the Public Examinations in its own hands and by making these the only means of gaining rank or position, it prescribes the nature and extent of the knowledge chiefly acquired for their attainment.

The theory on which it acts seems to be that of Confucius, the wisdom of which the long stability of the Chinese Empire has tested, that to make men good subjects you have only to make them wise, to do which, it is only necessary to give them education; and again, that though a strong Government, keeping the people down by severity, may prevent their rebelling, it is only a good one ruling them by persuasion, that can prevent their desiring and seeking to do so.

This theory, having been adopted, has been put in practice in China for centuries, the measures taken for its efficient working reflecting the highest credit on Chinese statesmen.

First.—All official employment has, until very lately, when this rule has been most unhappily deviated from, been the reward of knowledge, representing as it does in Chinese minds, wisdom, knowledge only to be acquired by following the course of study prescribed by Government.

Secondly.—The Emperor, by his example and by his periodical exhortations, sets and keeps up the fashion, and by making the interior not the exterior of a man the test by which his pretensions to position are determined, causes his subjects to devote more care to the former than to the latter.

And lastly, by keeping up a system by which all the burthens of the state fall on the rich ignoramuses, while all the prizes fall to the scholars, the spirit of economy, so strong in Chinese breasts, is enlisted in the pursuit of knowledge.

Thus, Education is so widely spread in China, that Yeh, when asked how they managed to do justice there, none of the Mandarins being able to speak the local dialects, was able to say, Why, very easily: all the depositions are written down and submitted to the parties interested, and there is not a single household in China which has not at least one member able to read.

The elementary schools are, however, all in private hands, and so early do the Chinese youth commence their studies, that the rudiments are always taught at home, one Chinese philosopher, indeed, saying that education should commence previous, not subsequent to, birth, and the sage Mercuis is cited as an instance of the favorable results of this course being followed.

Having then learnt his A B C at home, or more correctly, having had his eye familiarized with the written character by getting up a certain number of easy simple signs answering to our pothooks and hangers, and been instructed in a few ordinary rules of decorum and behaviour, the young student is, if his father is too much engaged to attend to his instruction himself, and too poor to hire a tutor to do it for him, sent off to a public day School, where a little book is put into his hand which he has to learn by rote, and having thus accomplished the first drudgery of his life, it is explained to him; the first sentence impressing on him that he is by nature good, and that if he becomes depraved, he is then in an abnormal and unnatural condition.

To give him time to digest this and other similar pieces of wisdom, a second book, more difficult than the former, is given him to be learnt by rote, before it is explained, and having mastered this, he is

advanced to a higher class and the glorious study of Confucius is opened to him.

By the time he has learnt the four books by heart, and has read some of the commentaries upon them, he has finished the curriculum of study taught at ordinary schools, and, unless his family think his talents are sufficient to promise success at the examinations, his course of study; returning to his family utterly deficient in all scientific knowledge, believing that the world is flat, and that three quarters of it are Chinese, ignorant of Mathematics and caring little how far it is to the moon, but fully impressed with the truths that honesty is the best policy, that if you would be respected, you must respect others, that it is your duty to honor your parents and lay down your life for your prince, that you should never do wrong under any circumstances whatever, that you will do more by reforming yourself than by seeking to improve others, and that it is advantageous to tell the truth to your friends.

Should, however, the student shew signs of talent, his family subscribe to hire a tutor for him to read with, or he offers himself as a candidate for admission at one of the Government Schools, where, if successful, he has the advantage of receiving the instruction of the best masters, gratis, until he is qualified to try for a degree.

In these Schools, the Masters of which receive salaries varying from 4 to 40 Pounds a month, the books written by the ancient sages, edited by Confucius, are read with the numerous commentaries upon them, and the living commentary history, is studied; here too they are first initiated into the mystery of paraphrasing the moral maxims of the ancients and of writing themes upon them.

They now go in for their first degree, being equally able to compete if they have studied at home instead of at these public Colleges, and if successful, their education is thenceforth the care of the State. Educational Officers being appointed to assist and direct them, keeping up the spirit of emulation in them by frequent trials and examinations.

Many, however, now give up their studies, seeking employment as teachers in the schools or as tutors in private families and sometimes sacrificing their pride to their covetousness, becoming clerks in Public Offices.

Such as persevere, and there are instances of men doing so sixty years, become gradually perfect in the art of writing essays, and take their next degree, which renders them eligible for office, and, unless they prefer giving up their ambition for a tutorship, enrolls them in the large band of expectants, as they are called, who, in the hopes of gaining a post at some future day, give their services gratis until that time.

There is a higher degree than this, which, if you wish it, gives you office the moment you obtain it, but the examination for it is so strict and so severe, that comparatively few pass it; for this, you are not only required to paraphrase or write essays on texts taken from the four books, or the five classics, and to be well read in the history of China, but, the Ex-Commissioner says, must be able to write essays on subjects like the following:—"The dews fall in Autumn" shewing the connection between this extract from the Book of Odes and the system of taxation, in short to shew how every act of Government is, or rather might be, based on the classics.

This, as the degree of Master in Masonry, is the highest generally taken, but there is one still higher conferred by the Emperor himself, assisted by the greatest scholars in the Empire, this constitutes the successful candidate, a Member of the Imperial College of the Hanlin, where he is employed writing state papers until the Emperor has need of his services as an administrative Mandarin, or despatches him on some special mission, the diplomatists of China being generally selected from this body.

Thus, from the commencement of their education to its termination, Moral Philosophy is their only study, having mastered that they are then, says Confucius, wise, and as the wise man, he adds, is not a kettle, meaning thereby that he is fit for all purposes, not for one only, he is qualified to act as Judge and put his fellowmen to death, although, like Yeh, he has never opened a law book, as a revenue Officer, although ignorant of Arithmetic, or as an Engineer, although he has never heard of Geometry.

The explanation Yeh gives of this is, that the Chinese Officials always keep clerks to look up the law of a case, while they elicit the facts, or to make any calculations that may become necessary, a

latitude always being allowed, justice rather than equity being looked for in their Courts, and a surplus, rather than a nicely adjusted balance, in their accounts.

They have no industrial, agricultural or Art-Schools, sons, generally following in the footsteps of their fathers, thus rendering these unnecessary, for though, says the Ex-Commissioner their establishment might lead to improvement, they are not required, things going on very well as they are, and no improvement being wanted.

The study of languages is also neglected, for, as Yeh says, all foreigners who go to China learn Chinese, and what is the use of our taking all the trouble of learning foreign languages, to no end, for he ignores or disbelieves the fact, that foreign literature could give him many new ideas; in short, all knowledge, save of the writings of the wise men of China, is considered useless and unprofitable.

But although the area is so circumscribed, it takes a long time travelling over, so slowly do they progress, and some are thirty or forty years at their books, before they can take even the first degree, it is possible, however, to take them all at an early age, an instance being mentioned of a boy of sixteen gaining a chair in the Imperial College, while Yeh was only nineteen when he took his first, and nine and twenty when he took his last degree,—knowledge being the sole qualification required.

The final examination, that for the degree of Hanlin, is held by the Emperor himself, assisted by the wisest members of the College, that for the next or Doctor, is also held at Peking, the expenses of the successful candidates from and back to their villages, being defrayed by Government even for the next, that equivalent to the English Master of Arts examination, it is thought necessary to send special Examiners down from Peking, who, while on their Mission, rank with the highest provincial authorities, the last degree alone being conferred by the Literary Chancellor, an Official equal in rank to the Lieutenant-Governor of a Province.

Such is a brief sketch of male education, which, widely spread as it is, exercises a powerful influence over the Chinese mind, but which, ignoring as it does religion, as Yeh confesses, merely checks open vice and utterly fails in its great object to make men good.

Female education is not so widely spread: the female members of a family having their cookery and embroidery to fill up the hours, which, in the absence of all amusement, the boy is compelled to devote to his books; but girls nearly always receive some instruction from their parents, and if of good family are expected to be able to read and make verses.

There are instances of Chinese ladies devoting themselves to literature, and some of their best histories are written by women, but as there is nothing tangible to be gained by female learning, the Chinese ladies rarely go beyond the four books, even if they go so far, and having accomplished this, they return to their kitchen, where, more fortunate than their husbands, they acquire at least one useful science.

Save in the Province of Kuangtung (Canton) there are no girl-schools in the Chinese Empire, and as the Ex-Commissioner's modesty prevented his investigating their internal arrangements, we have no certain knowledge on this point; it is also customary in some places for daily Governesses to be employed, but the Ex-Commissioner is also quite unable to give any information respecting them.

PROCEEDINGS
OF THE
ASIATIC SOCIETY OF BENGAL,

FOR DECEMBER, 1858.

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The Monthly General Meeting of the Society was held on the 1st instant.

A. Grote, Esq., Vice-President, in the Chair.

The proceedings of the last meeting were read and confirmed.

Presentations were received.—

1.—From Dr. Theo. Cantor, vol. I. of the *Ichthyologiae Archipelagi Indici Prodrromus* by Doctor Bleeker.

2.—From the Secretary Royal Society of Antiquaries at Copenhagen, several publications of that Society.

3.—From the Secretary Royal Society of London, several Nos. of the Society's Proceedings, Vols. 146 and 147 of the Philosophical Transactions of the Society, and several other publications.

4.—From the Secretary Geological Society of Dublin, through Mr. Oldham, several vols. of the Journal of that Society.

5.—From the Secretary Government of Bengal, copy of a report on the Survey operations of the Lower Provinces for 1856-57.

6.—From Baboo Onongomohun Deb Mitter, a copy of the *Mittra Bungsabulli*.

Maharaja Suttish Chunder Roy Bahadoor, proposed by A. Grote, Esq., and seconded by the President was named for ballot at the next meeting.

Mr. C. Alabaster proposed by A. Grote, Esq., and seconded by W. S. Atkinson, Esq., was also named for ballot at the next meeting.

The Council reported.



1.—Recommending that Dr. Max Müller proposed by A. Grote, Esq., and seconded by E. B. Cowell, Esq., as a corresponding member, be named for ballot at the next meeting.

2.—That they had appointed a Committee for the examination of the Stacy coins received through Major Ferris. That the Committee had examined them, and given in their report, stating that, with a few inconsiderable exceptions the coins were correct according to the Catalogue. They had therefore empowered the Committee to order the payment of the sum named for the coins to Captain Wroughton, and to purchase an iron safe, should it be necessary for the security of the collection.

Communications were received—

1.—From the Venerable Archdeacon Pratt, a rejoinder to Capt. Tennant's reply to his paper on the Meridional Arc.

2.—From C. Alabaster, Esq., two catalogues of the bound and unbound Chinese Books in the Society's Library.

Resolved that the thanks of the Society be given to Mr. Alabaster.

3.—From the Officiating Under-Secretary Government of India, copy of a despatch from the Secretary to the Chief Commissioner of the Punjaub, communicating particulars of what has been ascertained regarding the fate of Mons. A. Schlagintweit.

*From R. TEMPLE, Esq. Secretary to the Chief Commissioner for the Punjaub.*

*To G. F. EDMONSTONE, Esq. Secretary to the Government of India Foreign Department, with the Governor General.*

*Dated Lahore, the 15th October, 1858.*

SIR,—I am directed to forward for the information of His Lordship the Governor General, copies of a letter and enclosures from the Commissioner Trans-Sutlej States, dated 5th Instant, from which it appears that Mr. A. Schlagintweit, Magnetic Surveyor, was taken prisoner by the Indijans about twelve or fourteen months ago, and if not killed by them, as is currently rumoured, must be still in captivity.

I have the honor, to be, &c.

W. WYLD, *Captain,*  
*Assistant Military Secretary, for Secretary.*

*From Major E. LAKE, Commissioner and Supdt. Trans-Sutlej States.  
To R. TEMPLE, Esq., Secretary to Chief Commissioner, Punjaub.*

*Dated Dhurmsala, the 5th October, 1858.*

SIR,—I have the honor to forward for the information of the Chief Commissioner the copy of a letter dated 2nd October, 1858, to my address from the Deputy Commissioner Kangra, together with a translation of the statement of Kutuballee Shah Yarkundee. If his information is to be depended upon, Mr. A. Schlagintweit must have been taken prisoner by the Indijans about twelve or fourteen months ago; and if not killed by them, (as is currently rumoured) must be in captivity.

2. In obedience to demi-official instructions of the Chief Commissioner, Major Taylor deputed in June last, messengers specially to Yarkund for the purpose of procuring more definite intelligence regarding Mr. Schlagintweit. Their return may be shortly expected.

I have the honor, to be, &c.

E. LAKE,

*From the Deputy Commissioner, Kangra.*

*To the Commissioner and Superintendent Trans-Sutlej States.*

*Dated, Dhurmsala, 2nd October, 1858.*

SIR,—I have the honor to subjoin an extract from a demi-official communication from Mr. G. Knox, Assistant Commissioner of Kooloo, together with a translation of the Vernacular statement sent.

2nd. The account has the appearance of being true and circumstantial; if it is so, and the account forwarded by the missionaries from Lahoul has also foundation, Mr. Schlagintweit must have long survived his first capture, as according to the story told to the missionaries he was living unmolested in the neighbourhood of Yarkund in December 1857, when a roving party of Indijans found him and eventually murdered him.

3rd. You will remember that two men from Yarkund whom Mr. Knox had an opportunity of questioning said that Mr. Schlagintweit had gone away with the Indijans.

4th. If I can elicit any thing more from Kuttub Ali Shah, I will report upon it. We may hope to have both Omerdeer's man and the messenger sent by Haree Chund back before the passes are closed.

I have the honor to be, &c.

R. TAYLOR,

*Deputy Commissioner.*

*Statement of KUTTUB ALEE SHAH Yarkundee, taken before Mr.  
Knox, 28th September, 1858.*

Last year in the month of Sawun (July) viz. 14 months ago, the Indijans came to Yarkund to fight with the Kuttæs and Chinese, and I went to Kurghulluck, two days' journey on this side. The Indijans took me and all the Punjabees, Cabulees, Cashmerees and Hindoostanees, in all some 40 or 50 persons, prisoners. At that time two Indijans and a Majanee were accompanying a Sahib who was coming from the Ladak side; these three men ran away with the Sahib's property and came to Kurghullock, there they stopped in the house of one Kurbun Khujjuck and they said to him, We have some property for sale, do you take it. When he had sent for the property and examined it, he found it to consist of 12 or 14 Thans Keenkhah, and some loongees, and some Daryayee, and some other property also, but I did not see it with my own eyes. Kurbun having seen the things, went and reported the fact to Hajee Nussur, Kardar of the Indijans, saying that these men were poor and had nothing of their own, they must have robbed this from somebody. Hajee Nussur sent for them and intimidated them, questioning them as to where they got the property, and whose it was. They at first asserted that the property was their own, but when threatened severely they stated that Mahomed Ameen had brought a Feringhee with him, and this property belonged to that Feringhee, and we have taken it and are escaping with it. Hajee Nussur asked where the Feringhee was, they replied "God knows! He was on his way to Yarkund, if he has gone there he will have arrived at the village of Gullean." Hajee Nussur therefore sent two or three of his own men and told them to go and fetch the Sahib; they therefore went to Gullean and brought the Sahib from thence to Kur-

ghulluck and Mahomed Ameen was also with him. Nobody understood the Sahib's speech in that country, they searched therefore for somebody who could understand him, in hope of finding some one who could understand Hindoostanee or Punjabee. I was in confinement and they took me to the place. Hajee Nussur told me to ask the Sahib why he had come there. I asked the Sahib. He replied that there was a Shahzada, son of Mihmood Shah, living in the Indijan country, and he had visited him (Mr. Schlagintweit) in Lahore, and had said, Do you come to Indijan, and I will establish friendly relations between the Nawab of Indijan and the Sahibs; that it was on this account that he was on his way to Indijan. Hajee Nassur confiscated all the Sahib's property, and put the Sahib in confinement and sent him to Tullah Khan, a principal Sirdar. When they put the Sahib in confinement, he said to me, "No one here understands my language and my belief is that these people will kill me, should you go to that side of the country, if you go by Koolloo, tell this matter to Hay Sahib; if you go by Cashmere tell it to whatever Sahib you meet." After this the Sahib went away. On the day that the Sahib went to Sirdar Tulla Khan, on the same day, the Chinese force came to fight with the Indijans, and the Indijans fought for half an hour and then ran away, and took the Sahib with them; when the Chinese force came, all the Indijan Kardars ran away, and we, forty or fifty men, who were in confinement, got free. I afterwards heard that Dil Khan the great Chief of the Indijans had taken the Sahib's property, and put him to death, but I only heard this from the report of travellers of Kashgur and Yarkund. I did not see it with my own eyes. *Question.*—Do you know anything of the property of the Sahib or his servants? *Answer.*—No—I do not know anything about them. I only saw the Sahib and Mahomed Ameen Moghul; some also said that Mahomed Ameen also had been killed; others that he was alive; others that he had his nose and ears cut off.

(Signed) *Kuttab Allee Shah Yarkundee.*

*Nuggur, 28th September, 1858.*

(*Extract.*)

A man has come to-day and gives some intelligence about Mr. Schlagintweit, he says he saw him when the Indijans were taking

him off, and Schlagintweit told him to mention what had occurred. I have taken down in writing his statement and herewith enclose it to you. I have given him a Purwannah as far as Kangra, as from all I see and hear I don't think him a spy or suspicious character. He says he is on his way to Rambag. If you think as I do will you kindly give him a purwannah onward. I send him in person to you, so you can gather much more from him by talking, and much more than I can convey to you in writing.

(Signed) G. KNOX.

4. From Baboo Radha Nauth Sikdar, an abstract of the Meteorological observations taken at the Surveyor General's Office during the months of June and July.

The Officiating Librarian submitted his usual monthly report for November last.

Dr. Thomson gave some account of the Botanical results of a recent visit to Parisnath.

#### LIBRARY.

The Library has received the following accessions during the month of December, 1858.

#### *Presented.*

Athenæum, for August 1858.—BY THE EDITORS.

Indische Studien, Vol. 4. P. 3.—BY DR. WEBER.

Journal of the Statistical Society, London, for September 1858.—BY THE SOCIETY.

The London, Edinburgh and Dublin Philosophical Magazine.—No. 106 for SEPTEMBER, 1858.

Zeitschrift der Deutschen morgenlandischen Gesellschaft.—BY PROF. DR. BROCKHAUS VOL. 12, P. 3., AND AN INDEX OF VOLS. 1—10.

Annalen der Chemie und Pharmacie, Vol. 107, P. 1. for JULY, 1853.

Al-hadirae Diwanus of Al-Yezidii.—BY DR. ENGELMANN.

Bleeker, P. Ichthyologiae Archipelagi Indici Prodromus, Vol. 1, Batavia.—BY DR. CANTOR.

S. M. Le Roi Frederic VII. de Danemark, sur—la construction des salles dites des géants Copenhague, 1857.—BY THE ROYAL SOCIETY OF ANTIQUARIES AT COPENHAGEN.

Rafn. C. C. Inscription Runique du Pireé interpretee.—COPENHAGUE. 1856, DITTO DITTO.

Extrait des Antiquites del' Orient.—COPENHAGUE, 1856.—DITTO.

Antiquarisk Tidsskrift, 1854.—DITTO.

S. M. Frederic VII. Roi de Danemark, Vestiges D'Asserbo et de Soborg decouverts,—COPENHAGUE, 1855.—DITTO.

Rafn. C. C. Antiquites Americaines, COPENHAGUE, 1845, ROYAL 4to.—DITTO.

Saga Jatvardar Konungs Hins, Helga, COPENHAGUE, 1852.—DITTO.

List of Members and of Books published by the Society, pamphlet 1857.—DITTO.

Proceedings of the Royal Society of London, Nos. 27, 28, 29, 31 and 32, 1857-58.—BY THE ROYAL SOCIETY OF LONDON.

List of Fellows of the Royal Society, 1856-57.—DITTO.

Philosophical Transactions of the Royal Society of London, for 1856-57, Vol. 146, Parts 2 and 3, Vol. 147 P. 1 and 2.

Address of the President at the Anniversary Meeting of the Royal Society, 1857.—DITTO.

JOHNSON, M. J. (M. A.) Meteorological Observations made at the Redcliffe Observatory, OXFORD, 1856.—DITTO.

Observations Meteorologiques, faites a Nijne-Taguilsk, Annee 1856,—PARIS 1858, DITTO.

Compte Rendu Annual adresse A. S. Exc. M. de Brock., Pur le directeur de l'observatoire Physique central, Année 1855, ST. PETERSBOURG, 1856.—DITTO.

Sir Humphry Davy's Discourses, 1820-26 London.—DITTO.

Report on the adjudication of the Copley Rumford and Royal Medals, London, 1834,—DITTO.

SCHULTZ, GEORGE AND EDWARD. Specimen Tables calculated and stereomoulded by the Swedish Calculating Machine, London, 1852,—2 COPIES.—DITTO.

Journal of the Academy of Natural Sciences of Philadelphia, New Series Vol. 3. P. 4. 1855-58.—BY THE ACADEMY.

Proceedings of the Academy of Natural Sciences of Philadelphia, Vol. 8, 1856.—DITTO.

Bopp. Franz. Vergleichende Grammatik des Sanscrit, Send, Griechischen, Lateinischen, Littanischen, Altslavischen, Gothischen, und Deutschen. Erster Band, Berlin, 1857.—BY THE AUTHOR.

Journal of the Geological Society of Dublin, Vol. II. P. 1, 2, 3, Vol. III. P. 1, 2, 3, 4, Vol. IV. P. 1, 2, Vol. V. P. 1, 2, 3, and Vol. 6.—BY THE SOCIETY.

The Oriental Baptist for November 1858.—BY THE EDITOR.

Calcutta Christian Observer for Nov. 1858.—BY THE EDITORS.

Bibidharta Sangraha, for Assar.—BY THE EDITOR.

Written defence of Roy Kissory Chand Mittra by Babu R. L. MITTRA.

Report on a project for the supply of Water to the Poona Cantonment, with Plans and sections in a separate case.—BY THE SECRETARY P. WORKS DEPARTMENT.

Sanscrit Worterbuch Herausgegeben von der Kaiserlichen Akademie der Wissenschaften, by Profr Bohtlingk and Rudolph Roth. Erster Theil and Zweiter Theil.

The Oriental Christian Spectator for October, 1858.—BY THE EDITOR.

Carrington A. Catalogue of 3735 Circumpolar Stars observed at Redhill, for 1855.—BY THE ROYAL SOCIETY.

Report of the Survey Operations of the Lower Provinces from Oct. 1856 to Sept. 1857.—BY THE GOVT. OF BENGAL.

Defence of Roy Kissory Chund Mittra. From Baboo Rajendralal Mittra.

#### PURCHASED.

Travels in Central Africa, Vols. 4 and 5—BY DR. BARTH.

Comptes Rendus, Tome 47, Nos. 6, 7, 8, 9.—BY THE ACADEMY OF SCIENCES, PARIS.

The Annals and Magazine of Natural History No. IX. Sept. 1858.

The Literary Gazette, Nos. 7, 8, 9, 10, 11.

Revue des Deux Mondes, for August and Sept. 1858.

Annales des Sciences Naturelles, Tome 8. *Paris*.

Journal des Savants, for August 1858. *Paris*.

Revue et Magasin de Zoologie, No. 7. *Paris*.

Geschichte des Englishen Reiches in Asien, Von Karl Friedrich Neumann, Erster and Zweiter Band, *Leipzig*, 1857.

Guenee's Suites á Buffon, Histoire des Insectes,—Lepidopteres, Tome IX. *Paris*.

— Planches, 10 Livraison Insectes, Lepidopteres, *Paris*.

Notices et Extraits des manuscrits de la Bibliotheque Imperiale, Tome 16, 17, 18, p. 1st Tome 19, p. 2.

Expedition de Timiour-lenk our Tamerlan, by Mr. Charmoy.

Vendidad Sade, Troisieme Livraison, *Paris*, 1855.—BY MR. JULES THONNELIER.

FOR JANUARY, 1859.

At the Annual General Meeting of the Society held on the 5th January, 1859.

A. Grote, Esq., V. P., in the Chair.

The proceedings commenced by the Secretary reading the following note from the Hon'ble Sir James Colville, Kt., President of the Society, announcing his wish to resign, in consequence of his intended departure from India.

*Calcutta, December 24th, 1858.*

E. B. COWELL, Esq., *Secretary, Asiatic Society.*

SIR,—My resignation of the office of Chief Justice has been accepted by the Secretary of State for India ; and I purpose to leave India at the end of March, 1859.

In this state of things I ought not, I conceive, to be proposed for re-election as President of the Asiatic Society of Bengal, at the approaching annual meeting of the Society. The Society ought then to have the opportunity of electing a President who may be presumed to be capable of performing the duties of the office during the whole year. I beg, therefore, that you will circulate this letter amongst the Members of the Council, in order that they may determine whom they will propose as the next President ; I beg also that if there be no objection to that course, this letter may be laid before the Society at its annual meeting.

I am naturally desirous to take that opportunity of expressing my deep sense of the honor which the Society has conferred upon me, in electing me for ten successive years to be its President ; and of apologizing for my many short-comings in the discharge of the duties of that office. I have never disguised from myself that I owed this distinction rather to the accident of official rank, than to my personal qualifications for the office. I have always felt that the President of our Society ought to be one who had established some reputation for himself, either in the field of scientific inquiry, or in that of antiquarian research ; and I was once most anxious to make way for one who had every qualification which the President of such a Society ought to possess, the late Sir Henry Elliot. His absence from Calcutta frustrated my desires ; and I continued to



enjoy the honor annually bestowed upon me, with an undiminished sense of my own unworthiness, and chiefly because I was assured by my friends that my continuance in the chair was useful to the Society. If it has been so, the result is mainly due to the efficient and friendly co-operation of the gentlemen who have from time to time held the office of Secretary, and of my other colleagues in the Council.

That the Society may find, as it easily may, an able and more efficient President, and may long flourish under him and his successors, is the sincere wish of

Sir,

Your most obedient faithful servant,

JAMES W. COLVILE.

The Chairman observed that he felt sure that this announcement would be received by the meeting, and by the Society generally, with very great regret. He then moved the following Resolution which was seconded by Mr. C. Beadon.

That the Society, while it congratulates the Hon'ble Sir James Colvile on his approaching return to England, desires to express its regret at the loss of his valuable services, and to record its grateful thanks for the zeal and ability with which he has discharged the office of President for the last ten years, and has uniformly exerted himself to promote the objects and interests of the Society.

Carried unanimously.

The Secretary proceeded to read the following report:—

The Council of the Asiatic Society in submitting their usual Annual report, again have to remark with regret, that the continued disturbance of the country appears materially to have interfered with the welfare of the Society.

The total number of Members\* now on the rolls is 133, against

\* Ordinary. Paying. Absent.

|      |      |      |    |
|------|------|------|----|
| 1851 | 130, | 124, | 6  |
| 1852 | 139, | 122. | 17 |
| 1853 | 146, | 123, | 23 |
| 1854 | 155, | 129, | 26 |
| 1855 | 162, | 128, | 34 |
| 1856 | 167, | 131, | 36 |
| 1857 | 147, | 109, | 38 |
| 1858 | 133, | 95,  | 38 |

167 in 1856, and 147 in 1857, shewing a decrease of 34 ordinary Members within the last two years.

The elections during the year have been only two, while the losses have been 16. Of these 11 have been caused by retirement, four by death, and one under bye law 13 of the Society's rules. Of the 133 Members on the rolls, 38 are absent in Europe, and two are life Members, leaving only 93 on the paying list.

Dr. H. Falconer and B. H. Hodgson, Esq., have, on their departure for Europe, been added to the list of honorary Members, and Herr R. Schlagintweit has been elected a corresponding Member of the Society.

The obituary includes the names of four ordinary Members, viz. : the late Bishop Wilson, Lieutenant F. J. Burgess, Dr. F. P. Strong, and Baboo Nogendra Nauth Tagore; of one honorary Member, General Count Ventura; and of one associate, Mr. H. Piddington.

In the Venerable Bishop Wilson, the Society has to regret one who was for many years a zealous Member, and who for ten years held the office of Vice-President.

Mr. Piddington was connected with the Society for nearly thirty years, and at various times served in the capacities of Officiating Secretary, Assistant Secretary, and Curator of the Geological Department. In him the Society has lost a most able and constant contributor to the Journal, and Science an indefatigable votary.

#### FINANCES.

The loss of a large number of Members, and the difficulty of making remittances from the Mofussil, have seriously affected the income of the Society. The total receipts during the past year have been Rupees 17,206-6-1, whilst those of the preceding year were Rupees 22,504-12-3. The expences have been Rupees 15,088-14-7. To this sum, however, has to be added the cost of the repairs of the Society's premises, Rupees 2,280, which will make the expenditure amount to about the same sum as in 1857.

The income includes a sum of Rupees 500, paid by Rajah Pra-taub Chunder Singh as the amount of his compensation fee, which has been invested in Government securities, and another of Rupees 1,734-16-8, received from the Oriental Fund in liquidation of the advance made to it in 1856.

The liabilities of the Society amount to Rupees 6,810-3-10; to meet which there is a cash balance in hand to the extent of Rupees 3,451-12-3, Company's paper, to the value of 5,000, and outstanding assets to the amount of Rupees 6,289-10-3. Rupees 2,255-7-3 have been written off in the course of the year as unrealizable.

The probable receipts of the ensuing year may be assumed at Rupees 12,300, and of expenses at Rupees 11,533, the estimate under the usual heads being—

## INCOME.

|                                    |       |        |     |
|------------------------------------|-------|--------|-----|
| Contributions, . . . . .           | 6,000 | 0      | 0   |
| Admission Fee, . . . . .           | 100   | 0      | 0   |
| Government Grant at 300, . . . . . | 3,600 | 0      | 0   |
| Sale of Books, . . . . .           | 700   | 0      | 0   |
| Journal, . . . . .                 | 1,000 | 0      | 0   |
| Interest, . . . . .                | 250   | 0      | 0   |
| Miscellaneous, . . . . .           | 50    | 0      | 0   |
|                                    | <hr/> |        |     |
|                                    | Rs.   | 12,300 | 0 0 |
|                                    | <hr/> |        |     |
| Monthly average, . . . . .         | 1,025 | 0      | 0   |

## EXPENDITURE.

|                                  |       |        |     |
|----------------------------------|-------|--------|-----|
| Museum, . . . . .                | 4,645 | 0      | 0   |
| Library Establishment, . . . . . | 936   | 0      | 0   |
| Purchase of Books, . . . . .     | 500   | 0      | 0   |
| Book-binding, . . . . .          | 300   | 0      | 0   |
| Contingencies, . . . . .         | 200   | 0      | 0   |
| General Establishment, . . . . . | 1,494 | 0      | 0   |
| Journal, . . . . .               | 2,500 | 0      | 0   |
| Miscellaneous, . . . . .         | 500   | 0      | 0   |
| Building, . . . . .              | 400   | 0      | 0   |
| Deposit, . . . . .               | 58    | 0      | 0   |
|                                  | <hr/> |        |     |
|                                  | Rs.   | 11,533 | 0 0 |
|                                  | <hr/> |        |     |
| Monthly average, . . . . .       | 961   | 1      | 4   |

## LIBRARY.

The Library has received important accessions of Scientific and Oriental works to the extent of 300 vols., during the year under report. The presentations from learned Societies and Institutions have been rich and various, and the Society's purchases include most of the leading scientific and other periodicals.

Mr. Chaloner Alabaster has furnished the Society with a Catalogue of the Chinese works in the Library, which will shortly appear in the Journal, and the Librarian is preparing a list of incomplete Works and Transactions of learned Societies, in order that the Vols. wanting may be procured from Europe.

## STACY COLLECTION OF COINS.

The Council having been in treaty during the last two years for the purchase of this collection of coins, have at last succeeded in securing it. A Committee which was nominated to examine the coins, reports them to be complete, according to Mr. E. Thomas's Catalogue, with a very few exceptions. The sum of 2,938 Rupees originally subscribed for the purchase of this collection, was realized in full, and the balance, Rupees 1,062, has been made up from the Society's Funds out of the grant of 1,200 Rupees, accorded for that purpose by a special vote. The Committee hope ere long to determine the best means of preserving and exhibiting this valuable collection, together with other coins already in the Society's possession.

## MUSEUM.

The repairs of the building having occupied the greater part of the year, the Museum has been closed to public inspection for a lengthened period. The trouble of removing at every successive stage the articles occupying the Society's premises, has protracted the repairs considerably. They have, however, now been completed and the objects in the Museum re-arranged.

## JOURNAL.

Owing to the continued troubles of the country, and the consequent hindrance to the prosecution of scientific researches, only 4 Nos. of the Journal have been issued.

## ORIENTAL FUND.

It was announced in the last report, that the Oriental Fund would soon be in a position to enable the Editors to complete the unfinished works, and to commence a new series. The Council have since paid off all the liabilities of the Fund which had fallen due, and issued 7 Nos. of the Bib. Indica, including portions of 5 different works. Of these 4 have been edited by Babu Rajendra Lal Mittra, 2 by Mr. F. E. Hall, and 1 by Pundit Ishar Chandra Vidysagara. The names of the works are—

*Lalita Vistara*, or Memoirs of the Life and Doctrines of Sakya Sinha Fas. III, IV, V, being Nos. 143, 144,—145, edited by Baboo Rajendra Lal Mittra.

2. Taittiriya Brahmana of the Black Yajur Veda, with the commentary of Sayanacharya Fas. III. being No. 147, edited by Baboo Rajendra Lal Mittra.

3. The concluding part (Fasc. III.) of the Sankhya Pravachana Bhashya, with an English preface, being No. 141, edited by F. E. Hall, Esq.

4. Sūrya Siddhanta with its commentary, the Gudhartha Prakasaka, Fasc. IV., being No. 146, edited by F. E. Hall, Esq.

5. Sarvadarsana Sangraha; or an Epitome of the different systems of Indian Philosophy, by Mādhavachyarya; Fas. II. being No. 142, edited by Pundit Issurechandra Vidyasagara.

The publication of the Taittiriya Yajur Veda will be resumed during the ensuing year; and the Editors report that they hope very shortly to send the ninth Fas. to the press. The various unfinished works will be completed as speedily as possible, and when any new works are undertaken, it will be done with every regard to the recommendations of Professor H. H. Wilson, and the wishes expressed in the dispatch of the Hon'ble Court of Directors.

## OFFICERS.

The Council have had every reason to be satisfied with the zeal and assiduity with which the Curator and the Assistant Secy. have discharged their duties. The latter has obtained leave of absence for 6 months, and his office has been temporarily filled by Baboo Bhobany Persaud Dutt.

The Report was adopted.

The Meeting then proceeded to ballot for the Council and Officers for the ensuing year. Dr. Eatwell and T. Oldham, Esq., were appointed scrutineers, and at the close of the ballot, the Chairman announced the following result:—

|                           |                      |
|---------------------------|----------------------|
| A. Grote Esq., .....      | President.           |
| Col. R. Strachey, .....   | } Vice-Presidents.   |
| Dr. T. Thomson, .....     |                      |
| Baboo Ramapersaud Roy,    |                      |
| C. Beadon, Esq.           |                      |
| Dr. T. Boycott.           |                      |
| Baboo Rajendralal Mittra. |                      |
| E. A. Samuells, Esq.      |                      |
| Baboo Ramgopal Ghose.     |                      |
| T. Oldham, Esq.           |                      |
| Capt. C. H. Dickens.      |                      |
| Capt. W. N. Lees.         |                      |
| Dr. W. Crozier.           |                      |
| W. S. Atkinson, Esq., ... | } Joint-Secretaries. |
| E. B. Cowell, Esq., ..... |                      |

After acknowledging in a few words the honour which had just been conferred on him, the new President congratulated the meeting on those passages in the Report which announced the resumption of the publication of the *Bib.-Indica*, and the completion of the purchase of the Stacy Cabinet of Coins.

ABSTRACT STATEMENT  
OF  
RECEIPTS AND DISBURSEMENTS  
OF THE  
ASIATIC SOCIETY  
FOR  
THE YEAR, 1858.

## STATEMENT

*Abstract of the Cash Accounts*

|                                                                                                                    |     | RECEIPTS. |    |   |       |                          |   |  |  |
|--------------------------------------------------------------------------------------------------------------------|-----|-----------|----|---|-------|--------------------------|---|--|--|
| CONTRIBUTIONS.                                                                                                     |     | 1857      |    |   |       | 1858                     |   |  |  |
| Received from Members,                                                                                             | Rs. | 7,068     | 0  | 0 | 6,923 | 8                        | 0 |  |  |
|                                                                                                                    |     |           |    |   |       | 6,923 8 0                |   |  |  |
| ADMISSION FEE.                                                                                                     |     |           |    |   |       |                          |   |  |  |
| Received from new Members,                                                                                         | ..  | 256       | 0  | 0 | 96    | 0                        | 0 |  |  |
|                                                                                                                    |     |           |    |   |       | 96 0 0                   |   |  |  |
| JOURNAL.                                                                                                           |     |           |    |   |       |                          |   |  |  |
| Sale proceeds of and Subscription to the Journal of the Asiatic Society,                                           |     | 1,931     | 10 | 5 | 496   | 3                        | 0 |  |  |
|                                                                                                                    |     |           |    |   |       | 496 3 0                  |   |  |  |
| LIBRARY.                                                                                                           |     |           |    |   |       |                          |   |  |  |
| Sale proceeds of Books,                                                                                            |     | 1,225     | 4  | 0 | 566   | 5                        | 9 |  |  |
| Refund by transfer of amount erroneously charged in Messrs. Williams and Norgate's account of 1857, as per contra, | ..  |           |    |   | 170   | 10                       | 0 |  |  |
| Sale proceeds of old plates,                                                                                       | ..  |           |    |   | 10    | 0                        | 0 |  |  |
| Ditto duplicate coins,                                                                                             | ..  |           |    |   | 37    | 12                       | 6 |  |  |
|                                                                                                                    |     |           |    |   |       | 784 12 3                 |   |  |  |
| MUSEUM ZOOLOGY.                                                                                                    |     |           |    |   |       |                          |   |  |  |
| Received from the General Treasury at 300 Rs. per month,                                                           | ..  | 3,600     | 0  | 0 |       |                          |   |  |  |
|                                                                                                                    |     |           |    |   |       | 3,600 0 0                |   |  |  |
| SECRETARY'S OFFICE,                                                                                                |     | 9 5 6     |    |   |       |                          |   |  |  |
| Discount on postage Stamps,                                                                                        | ..  |           |    |   | 0     | 15                       | 0 |  |  |
| Refund of Postage,                                                                                                 | ..  |           |    |   | 21    | 6                        | 6 |  |  |
| Sale proceeds of old Ink Bottles,                                                                                  | ..  |           |    |   | 0     | 5                        | 0 |  |  |
|                                                                                                                    |     |           |    |   |       | 22 10 6                  |   |  |  |
| VESTED FUND,                                                                                                       |     | 240 0 0   |    |   |       |                          |   |  |  |
| Interest on Company's Paper from the Bank of Bengal,                                                               | ..  |           |    |   | 220   | 0                        | 0 |  |  |
| Discount on ditto,                                                                                                 | ..  |           |    |   | 31    | 6                        | 2 |  |  |
| Interest on 1734-10-8 advanced to the O. P. Fund from 1st January to 30th June, 1858, at 4 per cent.               | ..  |           |    |   | 34    | 11                       | 1 |  |  |
|                                                                                                                    |     |           |    |   |       | 286 1 3                  |   |  |  |
| GENERAL ESTABLISHMENT,                                                                                             |     | 74 9 9    |    |   |       |                          |   |  |  |
| Savings,                                                                                                           | ..  |           |    |   | 35    | 10                       | 5 |  |  |
| Fine,                                                                                                              | ..  |           |    |   | 1     | 0                        | 0 |  |  |
|                                                                                                                    |     |           |    |   |       | 36 10 5                  |   |  |  |
| DEPOSIT ACCOUNT,                                                                                                   |     | 221 5 0   |    |   |       |                          |   |  |  |
| Lieut. H. G. Raverty,..                                                                                            | ..  |           |    |   | 27    | 0                        | 0 |  |  |
| A. Grote, Esq.                                                                                                     | ..  |           |    |   | 4     | 4                        | 0 |  |  |
| Major J. G. Stephen,                                                                                               | ..  |           |    |   | 32    | 0                        | 0 |  |  |
| Baboo Roodernauth Doss,                                                                                            | ..  |           |    |   | 11    | 0                        | 0 |  |  |
|                                                                                                                    |     |           |    |   |       | 74 4 0                   |   |  |  |
|                                                                                                                    |     |           |    |   |       | Carried over, 12,320 1 5 |   |  |  |



No. 1.

*of the Asiatic Society for 1858.*

## DISBURSEMENTS.

| JOURNAL.                           | 1857      | 1858      |
|------------------------------------|-----------|-----------|
| Freight, .. ..                     | 77 3 10   |           |
| Printing charges, .. ..            | 23 11 0   |           |
| Lithographing, .. ..               | 185 12 0  |           |
| Commission on Sale of Books, .. .. | 7 12 0    |           |
| Purchase of Postage Stamps, .. ..  | 27 8 0    |           |
| Engraving, .. ..                   | 18 0 0    |           |
| Copying charges, .. ..             | 5 0 0     |           |
| Petty charges, .. ..               | 7 13 0    |           |
|                                    | 2,450 1 9 | 352 11 10 |

## LIBRARY.

|                                                          |           |            |
|----------------------------------------------------------|-----------|------------|
| Salary of the Librarian 12 months at 70 per month, .. .. | 840 0 0   |            |
| Establishment ditto at 8 per month, .. ..                | 96 0 0    |            |
| Purchase of Books, .. ..                                 | 113 1 0   |            |
| Ditto a copy of the Panoramic View of Calcutta, .. ..    | 6 0 0     |            |
| Book Binding, .. ..                                      | 422 1 0   |            |
| Postage, .. ..                                           | 9 0 0     |            |
| Commission on sale of Books, .. ..                       | 24 13 9   |            |
| Cleaning charges, .. ..                                  | 7 14 0    |            |
| Freight, .. ..                                           | 14 8 10   |            |
| Extra Duftory, .. ..                                     | 27 12 0   |            |
| A Wooden Ladder for the Library, .. ..                   | 6 0 0     |            |
| Two Blank record Books, .. ..                            | 5 8 0     |            |
| Lithographing, .. ..                                     | 2 0 0     |            |
| Two pieces of new Mat for the Library Room, .. ..        | 11 2 9    |            |
| Repairing Punkha of the ditto, .. ..                     | 2 0 0     |            |
| Copying charges, .. ..                                   | 6 0 0     |            |
| Petty Charges, .. ..                                     | 1 6 6     |            |
|                                                          | 6,804 8 6 | 1,595 3 10 |

## MUSEUM.

|                                                                         |           |            |
|-------------------------------------------------------------------------|-----------|------------|
| Salary of the Curator E. Blyth, Esq. at 250 per month, 12 months, .. .. | 3,000 0 0 |            |
| House rent at 40 per month, 12 months, .. ..                            | 480 0 0   |            |
| Establishment, .. ..                                                    | 584 0 6   |            |
| Contingent charges, .. ..                                               | 233 2 6   |            |
| Extra Taxidermist's salary, .. ..                                       | 348 4 0   |            |
| A Blank record Book, .. ..                                              | 5 8 0     |            |
| Six Glass Cases for Birds, .. ..                                        | 780 0 0   |            |
| Ten Shelves ditto, .. ..                                                | 33 0 0    |            |
|                                                                         | 4,496 9 6 | 5,463 15 0 |

Carried over, 7,411 14 8

|                                                   |                  |              |   |   |
|---------------------------------------------------|------------------|--------------|---|---|
|                                                   | Brought forward, | 12,320       | 1 | 5 |
| STACY COIN COLLECTION.                            | 1857             |              |   |   |
| Subscriptions for the purchase of the Collection, |                  | 212          | 0 | 0 |
| Amount of last year's subscriptions,              | ..               | 2,726        | 0 | 0 |
|                                                   |                  | <u>2,938</u> | 0 | 0 |

|                                                                                                         |       |   |   |               |
|---------------------------------------------------------------------------------------------------------|-------|---|---|---------------|
| MESSRS. WILLIAMS AND NORGATE.                                                                           |       |   |   |               |
| Received through Rajah Radhacant Deva, duty on parcels, .. ..                                           | 26    | 0 | 0 |               |
| Proceeds of sundry books sold on their account of Weber's Modern Investigations on Ancient India, .. .. | 1     | 0 | 0 |               |
| Ditto ditto a copy of Muller's Buddhism, .. ..                                                          | 1     | 0 | 0 |               |
| Ditto ditto a copy of Bopp's Comparative Grammar, .. ..                                                 | 25    | 0 | 0 |               |
| Ditto ditto a copy of Goldstüker's Sanscrit Dictionary, .. ..                                           | 5     | 0 | 0 |               |
| Ditto ditto White Yajurveda, Vol. I. .. ..                                                              | 32    | 8 | 0 |               |
|                                                                                                         | 4,419 | 8 | 5 | <u>90 8 0</u> |

|                                                 |     |   |   |            |
|-------------------------------------------------|-----|---|---|------------|
| ORIENTAL PUBLICATION FUND.                      |     |   |   |            |
| Received from the Oriental Publication Fund, .. | 765 | 5 | 4 | 1,734 10 8 |

|                                                                                                                                                             |            |    |   |  |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------|------------|----|---|--|
| PROFIT & LOSS.                                                                                                                                              |            |    |   |  |
| Received from the Administrator General's Office being a dividend on account Capt. W. E. Boyes' contributions, in part of amount written off in 1856, .. .. | 104        | 6  | 0 |  |
| Ditto ditto Oriental Bank on a Bill for 50£., ..                                                                                                            | 2          | 10 | 0 |  |
| Ditto ditto Muddoosoodun Dey, sale proceeds of a copy of the Mahabharata, in part of amount written off in 1856, .. ..                                      | 15         | 0  | 0 |  |
|                                                                                                                                                             | <u>122</u> | 0  | 0 |  |

|                          |          |   |   |  |
|--------------------------|----------|---|---|--|
| DR. J. FAYRER.           |          |   |   |  |
| Refund of Postage, .. .. | 1        | 2 | 0 |  |
|                          | <u>1</u> | 2 | 0 |  |

|                            |              |    |   |  |
|----------------------------|--------------|----|---|--|
| BALANCE OF 1857.           |              |    |   |  |
| Bank of Bengal, .. ..      | 2,321        | 11 | 3 |  |
| Cash in hand, .. ..        | 8            | 14 | 0 |  |
|                            | <u>2,330</u> | 9  | 3 |  |
| Inefficient Balance, .. .. | 581          | 15 | 3 |  |

Carried over, 20,118 14 7

## SECRETARY'S OFFICE.

Brought forward, 7,411 14 8  
1857

|                                      |           |         |           |
|--------------------------------------|-----------|---------|-----------|
| General Establishment, ..            | ..        | 822 0 0 |           |
| Secretary's Office Establishment, .. | ..        | 672 0 0 |           |
| Copying charges, ..                  | ..        | 10 0 0  |           |
| Postage,.. ..                        | ..        | 9 0 6   |           |
| Stationery, ..                       | ..        | 75 6 3  |           |
| Three Blank Books for writing, ..    | ..        | 16 8 0  |           |
| Purchase of Postage Stamps, ..       | ..        | 13 11 0 |           |
| Freight, ..                          | ..        | 14 0 0  |           |
| A Sheet Almanac for 1858, ..         | ..        | 1 0 0   |           |
| Petty charges, ..                    | ..        | 27 7 0  |           |
|                                      | 1,739 0 9 |         | 1,661 0 9 |

## BUILDING.

|                        |         |         |         |
|------------------------|---------|---------|---------|
| Assessment, ..         | ..      | 281 4 0 |         |
| Ditto for Lighting, .. | ..      | 75 0 0  |         |
|                        | 895 2 6 |         | 356 4 0 |

## STACY COIN COLLECTION.

|                                           |    |           |           |
|-------------------------------------------|----|-----------|-----------|
| Paid to Major W. S. Ferris, on account of |    |           |           |
| Mrs. Wroughton, for the Stacy Coins, as   |    |           |           |
| per receipt, ..                           | .. | 4,000 0 0 |           |
| Ditto a Lock for the Coin-Box, ..         | .. | 3 0 0     |           |
|                                           |    |           | 4,003 0 0 |

## DEPOSIT ACCOUNT.

|                                    |          |         |          |
|------------------------------------|----------|---------|----------|
| Rev. H. Hislop, ..                 | ..       | 16 11 0 |          |
| Lieut. C. J. Terrot, ..            | ..       | 9 0 0   |          |
| Rev. Isider Lowenthall, ..         | ..       | 9 0 0   |          |
| Baboo Roodernauth Doss, ..         | ..       | 9 0 0   |          |
| Lieut. H. G. Raverty, ..           | ..       | 117 0 0 |          |
| Hon'ble Sir J. W. Colville, Kt. .. | ..       | 3 0 0   |          |
| A. Grote, Esq. ..                  | ..       | 4 4 0   |          |
|                                    | 155 15 0 |         | 167 15 0 |

## VESTED FUND.

|                                                |           |         |          |
|------------------------------------------------|-----------|---------|----------|
| Paid Commission for the Collection of Interest |           |         |          |
| on Company's Paper, ..                         | ..        | 0 8 10  |          |
| Ditto Interest on Company's Paper, ..          | ..        | 2 6 11  |          |
| Ditto for Purchase of Government Security at   |           |         |          |
| 5 per cent. No. 51,090, dated 28th February,   |           |         |          |
| 1856-57, ..                                    | ..        | 500 0 0 |          |
|                                                | 4,021 8 9 |         | 502 15 9 |

## J. S. LAW, Esq.

|                                 |    |       |                          |
|---------------------------------|----|-------|--------------------------|
| Paid Freight on his account, .. | .. | 4 2 0 |                          |
|                                 |    |       | 4 2 0                    |
|                                 |    |       | Carried over, 14,107 4 2 |

Brought forward, 20,118 14 7

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Co.'s Rs. 20,118 14 7

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1857

1858

Brought, forward, 14,107 4 2

## MESSRS. WILLIAMS AND NORGATE.

Amount debited by transfer being erroneously entered in their account of 1857, in the following items.

|                               |    |          |
|-------------------------------|----|----------|
| 6 Bopp's Comparative Grammar, | .. | £12 12 0 |
| 25 Weber's Ancient India,     | .. | 0 18 9   |
| 15 Muller's Buddhism,         | .. | 0 17 6   |

£14 8 3 at 2s. p.

rupee 144 2 0

Ditto ditto duty on Parcels, .. 26 8 0

Commission on sale of Books, 170 10 0

Freight, .. 2 8 0

Purchase of Books on their account, 4 4 0

Bills on Oriental Bank Corporation at London, 21 8 0

£50-5-3 at 2s. .. 502 10 0

Packing charges, .. 0 9 11

2,970 11 4 702 1 11

## MISCELLANEOUS.

Advertising Meeting, .. 14 6 0

Meeting charges, .. 152 0 0

Polishing a Table, .. 7 12 3

New Mat for the Room, .. 8 11 0

White-washing a Punkha for the Meeting Room, 6 6 0

Illumination of the Asiatic Society's Rooms on

the 1st of November, .. 65 15 3

Petty charges, .. 24 6 0

432 15 0 279 8 6

15,088 14 7

## BALANCE.

Bank of Bengal, .. 3,442 3 5

In hand, .. 9 8 10

3,451 12 3

Inefficient Balance, .. 1,578 3 9

5,030 0 0

Co.'s Rs. 20,118 14 7

STATEMENT  
*Abstract of the Oriental*

| BALANCE OF 1857,                                                                                     |       | 1857       | 1858                  |
|------------------------------------------------------------------------------------------------------|-------|------------|-----------------------|
| Bank of Bengal, ..                                                                                   |       | 3,059 9 0  |                       |
| Cash in hand, ..                                                                                     |       | 29 4 9     | 3,088 13 9            |
|                                                                                                      |       |            | <hr/>                 |
| Inefficient Balance, ..                                                                              | ..    | ..         | 2,112 14 8 5,201 12 5 |
| SALE OF ORIENTAL PUBLICATIONS,                                                                       |       |            |                       |
| Received by Sale of Bib. Indica, ..                                                                  |       | 781 8 0    |                       |
| Ditto by Subscription to ditto, ..                                                                   |       | 187 10 0   |                       |
| Ditto by Sale of White Yajurveda, ..                                                                 |       | 46 4 0     |                       |
|                                                                                                      |       | 1,157 11 4 | <hr/> 1,015 6 9       |
| GOVERNMENT ALLOWANCE,                                                                                |       |            |                       |
| Received from General Treasury at 500 per month, ..                                                  |       | 6,000 0 0  | 6,000 0 0             |
| VESTED FUND.                                                                                         |       |            |                       |
| Interest on Company's Paper from Bank of Bengal, ..                                                  |       | 210 0 0    | 140 0 0               |
| DEPOSIT ACCOUNT.                                                                                     |       |            |                       |
| Received from Mahomed Hajee, ..                                                                      |       |            | 43 11 0               |
| CUSTODY OF ORIENTAL WORKS.                                                                           |       |            |                       |
| Savings of Establishment, ..                                                                         | 2 0 0 |            | 3 0 0                 |
| PROFIT AND LOSS.                                                                                     |       |            |                       |
| Received from the Administrator General's Office being a dividend on account of J. Reddie, Esq... .. |       |            | 0 12 3                |

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Carried over, 12,404 9 8

No. 2.

*Fund for the year 1858.*

|                                                                                         | 1857    | 1858       |
|-----------------------------------------------------------------------------------------|---------|------------|
| SALE OF ORIENTAL PUBLICATIONS.                                                          |         |            |
| Commission on Sale of Books, ..                                                         | 53 13 6 | 42 8 0     |
| VESTED FUND.                                                                            |         |            |
| Commission paid to the Bank of Bengal for<br>Collecting Interest on Company's Paper, .. |         | 0 5 8      |
| Interest paid to the Asiatic Society on the<br>Loan of Rs. 1,734-10-8, ..               |         | 34 11 1    |
|                                                                                         | 100 8 6 | 35 0 9     |
| CUSTODY OF ORIENTAL WORKS.                                                              |         |            |
| Salary of Librarian, at 30 per month, ..                                                | 360 0 0 |            |
| Establishment, .. ..                                                                    | 156 0 0 |            |
| Book binding, .. ..                                                                     | 329 0 0 |            |
| Books cleaning, .. ..                                                                   | 34 12 9 |            |
| A blank book for writing, .. ..                                                         | 1 8 0   |            |
| Twenty Stone Pedestals for the Almirahs of<br>the Library, .. ..                        | 10 0 0  |            |
| Ticca writer for examining the list of Sanscrit<br>Books, .. ..                         | 20 0 0  |            |
|                                                                                         | 683 0 0 | 911 4 9    |
| ASIATIC SOCIETY.                                                                        |         |            |
| Paid to the Society on account of Loan in full,                                         |         | 1,734 10 8 |
| COPYING MSS.                                                                            |         |            |
| Copying Charges, .. ..                                                                  | 80 3 9  | 36 8 0     |
| BIB. INDICA,                                                                            |         |            |
| Freight, .. ..                                                                          | 20 8 4  |            |
| Examining and making a list of the above, ..                                            | 5 0 0   |            |
| Packing Charges, .. ..                                                                  | 2 4 0   |            |
| Postage Stamps, .. ..                                                                   | 2 1 0   |            |
| A blank Acct. book, .. ..                                                               | 0 14 0  |            |
|                                                                                         |         | 30 11 4    |
| KITAB-UL MAABRAH,                                                                       |         |            |
| Printing Charges, .. ..                                                                 |         | 122 8 0    |
| TAI'TTIRIYA BRAHMANA',                                                                  |         |            |
| Printing Charges, .. ..                                                                 |         | 1,141 14 0 |
| VEDA NTA SUTRAS,                                                                        |         |            |
| Printing Charges, .. ..                                                                 |         | 36 8 0     |
| Carried over,                                                                           |         | 4,091 9 6  |

Brought forward, 12,404 9 8

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|           |        |   |   |
|-----------|--------|---|---|
| Co.'s Rs. | 12,404 | 9 | 8 |
|-----------|--------|---|---|

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*Asiatic Society's Rooms*  
31st Dec. 1853.

Examined,  
BHOBANYPROSAD DUTT,  
*Offg. Asst. Secy.*



|                               |    |    |    |                  |        |    |   |
|-------------------------------|----|----|----|------------------|--------|----|---|
|                               |    |    |    | Brought forward, | 4,091  | 9  | 6 |
| ITQUAN.                       |    |    |    |                  |        |    |   |
| Printing Charges,             | .. | .. | .. | ..               | 66     | 14 | 0 |
| SARVADARSHANA SA'NGRAHA.      |    |    |    |                  |        |    |   |
| Printing Charges,             | .. | .. | .. | ..               | 207    | 4  | 0 |
| LALITA VISTARA.               |    |    |    |                  |        |    |   |
| Printing Charges,             | .. | .. | .. | ..               | 450    | 0  | 0 |
| SA'NKHYA PRAVACHANA BHA'SHYA. |    |    |    |                  |        |    |   |
| Printing Charges,             | .. | .. | .. | ..               | 182    | 8  | 0 |
| FATU'HUL SHAM.                |    |    |    |                  |        |    |   |
| Editing Charges,              | .. | .. | .. | ..               | 104    | 0  | 0 |
| FATU'HUL A'BU' ISMAIL,        |    |    |    |                  |        |    |   |
| Editing Charges,              | .. | .. | .. | ..               | 128    | 8  | 0 |
|                               |    |    |    |                  | <hr/>  |    |   |
|                               |    |    |    |                  | 5,230  | 11 | 6 |
| BALANCE.                      |    |    |    |                  |        |    |   |
| Bank of Bengal,               | .. | .. | .. | 5,052            | 1      | 7  |   |
| In hand,                      | .. | .. | .. | 5                | 0      | 5  |   |
|                               |    |    |    | <hr/>            |        |    |   |
|                               |    |    |    | 5,057            | 2      | 0  |   |
| Inefficient Balance,          | .. | .. | .. | 2,116            | 12     | 2  |   |
|                               |    |    |    | <hr/>            |        |    |   |
|                               |    |    |    |                  | 7,173  | 14 | 2 |
|                               |    |    |    | <hr/>            |        |    |   |
|                               |    |    |    | Co.'s Rs.        | 12,404 | 9  | 8 |
|                               |    |    |    | <hr/>            |        |    |   |

Errors Excepted.

E. B. COWELL,  
*Secretary.*



LIST OF ORDINARY MEMBERS  
OF THE  
**ASIATIC SOCIETY OF BENGAL,**

ON THE 31ST DECEMBER, 1858.

The \* distinguishes non-subscribing Members.

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Abbott, Lieut.-Col. J. Artillery, Jullunder.

\*Allen, C. Esq., B. C. S., Europe.

\*Anderson, Lieut.-Col. W. Bengal Artillery, Europe.

Atkinson, W. S. Esquire, Calcutta.

Avdall, J. Esquire, Calcutta.

\*Baker, Lieut.-Col. W. E. Bengal Engineers, Europe.

Batten, J. H. Esquire, B. C. S. Cawnpore.

Beadon, C. Esquire, B. C. S., Calcutta.

Beaufort, F. L. Esquire, B. C. S., Calcutta.

\*Beckwith, J. Esquire, Europe.

\*Benson, Lieut.-Col. R., Europe.

Birch, Major Genl. R. J., H. C. B., Calcutta.

Bivar, Capt. H. S. 18th Regt. B. N. I., Assam.

Blagrave, Capt. T. C. 26th Regt. B. N. I., Trans-Sutledge Provinces.

Blanford, H. F. Esquire, Calcutta.

Blundell, E. A. Esquire, Singapore.

\*Bogle, Lieut.-Col. Sir A. Kt., Europe.

Boycott, Dr. T. Bombay M. S., Calcutta.

\*Brodie, Capt. T. 5th Regt. B. N. I., Europe.

Busheerooddeen Sultan Mahamed Sahib, Calcutta.

- Chapman, C. E. Esquire, B. C. S., Rajshaye.  
Chapman, R. B. Esquire, B. C. S., Calcutta.  
Colville, Hon'ble Sir J. W. Kt., Calcutta.  
\*Colvin, B. J. Esquire, B. C. S., Europe.  
\*Colvin, J. H. B. Esq., B. C. S., Europe.  
Cowell, E. B. Esq., B. A. Calcutta.  
Crozier, Dr. William, B. M. S., Calcutta.  
Dalton, Capt. E. S. 9th Regt. B. N. I., Chybassa.  
De Bourbel, Lieut. R. Bengal Engrs., Barrackpore.  
Dickens, Capt. C. H., Calcutta.  
Drummond, Hon'ble E., B. C. S., Calcutta.  
Eatwell, Dr. W. C. B., Calcutta,  
\*Edgeworth, M. P. Esq., B. C. S., Europe.  
Elliott, Hon'ble W., M. C. S., Madras.  
Ellis, Major R. R. 23rd Regt. B. N. I., Bundlekund.  
Elphinstone, Lieut. N. W. 4th Regt. B. N. I., Goorgariah.  
Erskine, Major W. C. Commr. of Sagur, Nurbudda Territories,  
Jubbulpore.  
\*Fayrer, Dr. J., B. M. S., Europe.  
Freeling, G. H. Esq., B. C. S., Hameerpore.  
Fytche, Major A. 70th Regt. B. N. I., Bassein.  
\*Gladstone, W. Esq., Europe.  
Govinchundra Sena, Baboo, Calcutta.  
\*Grapel, W. M. A. Esq., Europe.  
Grote, A. Esq., B. C. S., Calcutta.  
Hall, F. E. Esq., M. A., Sagur.  
Halsey, W. S. Esq., B. C. S., Europe.  
\*Hamilton, R. Esq., China.  
Hamilton, Sir, R. N. E. Bart., B. C. S., Indore.  
Hannynghton, Lieut.-Col. J. C. 63rd Regt. N. I., Berhampore.  
Hearsay, Major Genl. J. B., K. C. B. 10th Light Cavalry, Barrack-  
pore.  
Herschel, W. J. Esq., B. C. S., Jungipore.  
\*Hichens, Lieut. W. Bengal Engineers, Europe.  
Ishureepershad Singh, Rajah, Benares.  
\*Jackson, L. S. Esq., Europe.  
\*Jackson, W. B. Esq., B. C. S., Europe.

Jadava Kishna Singh, Baboo, Calcutta.

\*James, Capt. H. C. 32nd Regt. B. N. I., Europe.

Jerdon, T. C. Esq., M. M. S., Gazeepore.

\*Johnstone, J. Esq., Europe.

Joygopaul Bysack, Baboo, Calcutta.

Kabeeroodeen Ahmed Shah, Bahadoor, Sassaram.

Kaliprasunno Singh, Baboo, Calcutta.

Kay, Rev. W., D.D., Bishop's College.

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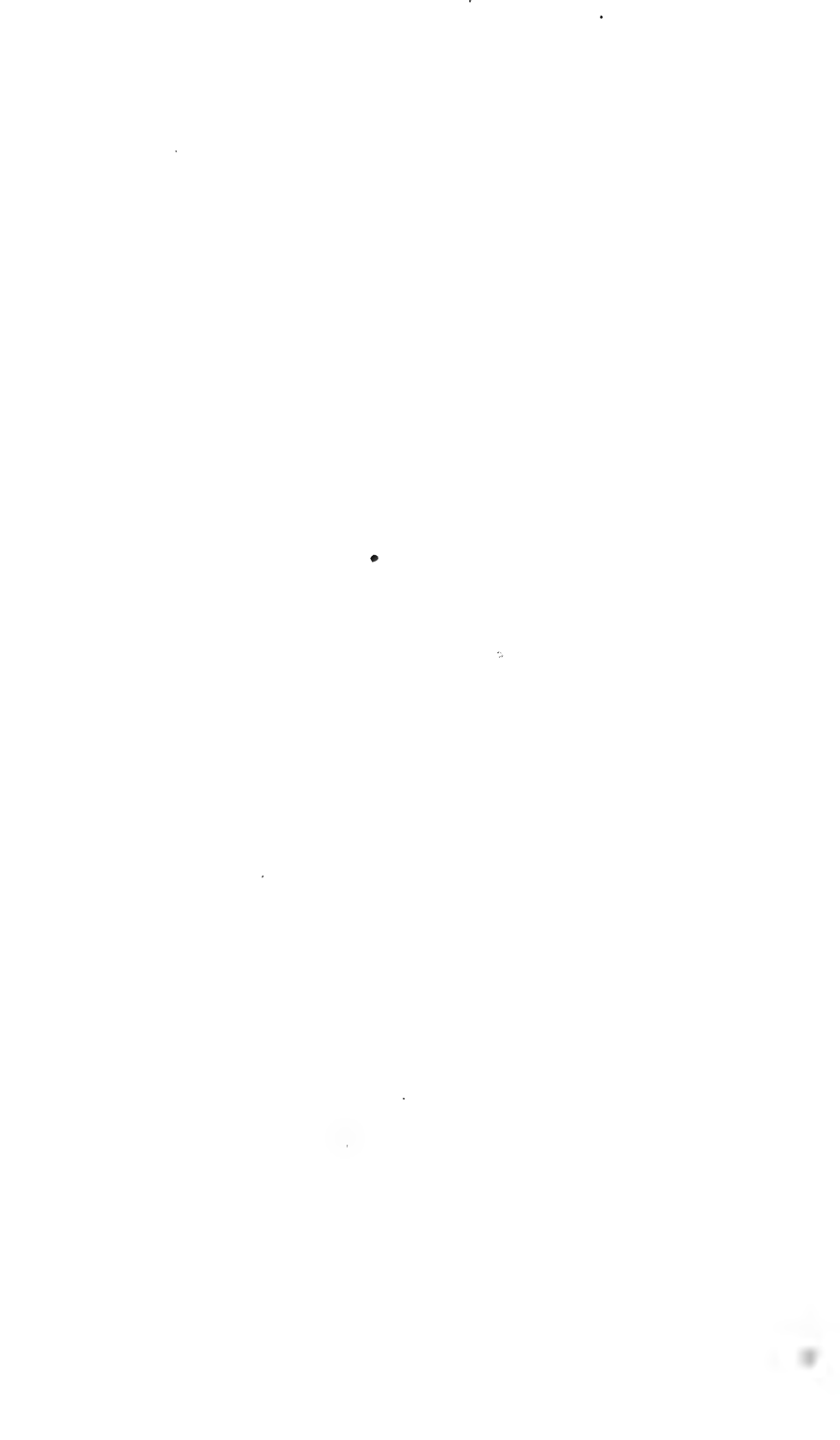
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# JOURNAL

OF THE

# ASIATIC SOCIETY.

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No. II. 1859.

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*Notes on the Flora of Lucknow with Catalogues of the cultivated and indigenous Plants.*—By THOS. ANDERSON, M. D., F. L. S., Garrison Asst. Surgeon, Fort William.

As a large part of Northern India, including the Punjaub, is under cultivation at all seasons of the year, its Flora may justly be styled Agrarian; only on unreclaimed land, does a spontaneous, shrubby (rarely arborescent) vegetation occur, and this composed of a limited number of well known species. From the existence of greater humidity, along the base of the Hills, a luxurious forest exists there, which seems to be merely an extension of the arboreous vegetation of the outer Himalayas. The plants, in the neighbourhood of all the stations in the Upper Provinces, are, with a few exceptions, of this Agrarian type, but mingled with an introduced Flora of considerable amount and with an extensive number of truly cultivated species.

In native gardens, many species, indigenous in Southern India, the Himalayas, and countries beyond the Indus, are cultivated, which, from boundaries being broken down, and the gardens abandoned, spring up spontaneously in waste places. To these are to be added a small, but widely spread, number of plants introduced by the various conquerors of the country, such as *Argemone Mexicana*, *Anona squamosa* and *reticulata*, *Parkinsonia aculeata*, etc. These various elements of the Flora of Northern India increase the manifold difficulties of all young Indian botanists in whose collections these cultivated plants are always to be found. That I may attempt

to supply a want, I myself have much felt, and at the same time avoid conveying a wrong impression of the extent of the Flora of Lucknow, I shall exclude from the catalogue all cultivated and introduced plants, and shall detail them at length in the following notes on the peculiarities of its climate and cultivation. Lucknow is situated in Lat.  $27^{\circ}$  E. Long.  $81^{\circ}$  on the right and south bank of the Goomtee, a considerable stream which rises in the marshy country about Khyraghur, near the base of the Nipal Himalaya. The valley of the Goomtee varies at Lucknow from one to four or five miles in breadth, and for the most part consists of a richly cultivated alluvial soil, interspersed with patches of sand, which are often blown into hillocks by the prevailing winds. The valley is bounded on both sides by banks of kunkur (nodules of limestone) rising about forty or fifty feet above the level of the river, which in some parts of its course, runs at their base. These banks are intersected by ravines of considerable extent running at right angles to the course of the river; they serve during the rains to drain the adjacent country. The sandy patches extend across Oude to the banks of the Ganges at Cawnpore, and are there connected with the sandy valley of that river.

The climate of Lucknow presents, with well marked features, the three seasons of Northern India, namely the cold season, from the middle of October to the end of March, the hot dry season, from the beginning of April to the middle or end of June, and the rainy season, extending over the months of July, August and September, passing into the cold weather during the first fortnight of October. The distinctive features of these seasons at Lucknow are, in the cold weather, considerable dryness, greatly diminished power of the sun's rays, though favoured by a cloudless sky, great nocturnal radiation, and consequently an extended daily thermometric range. My records of meteorological observations were destroyed during the mutinies of 1857, so that I am unable to give a thermometric table, but the minimum temperature recorded during 1856 was  $37^{\circ}$  Fahr. In the hot weather, the existence of steady hot westerly winds, excessive dryness, returning power of the sun's rays, and decrease of thermometric range give an almost African character to the climate. On the accession of the rains, the climate is

completely altered, the atmosphere becomes saturated with moisture and the fall of rain is considerable, the heat is much diminished, nocturnal radiation almost ceases while the sky is clouded, and the daily range of the thermometer reaches its minimum. As the season advances, the climatic conditions of the cold weather return, and by the 10th or 15th of October, that season has again commenced.

The climate of Lucknow more resembles that of the Punjab and Scinde than might be expected in so Eastern a district, for Rohilecund, several hundred miles to the west, has moister and more equable seasons. That such is the case at Lucknow is exemplified by the existence there of several species peculiar to the arid regions of India, and the Arabian deserts, and which, except at Cawnpore, do not occur east of the dry countries bounded by the Jumna. Dr. Thomson has thoroughly explored the neighbourhood of Moradabad in the west of Rohilecund, the district, immediately east of the Ganges, or west of Oude, and has not met with them there, nor did I observe them in the eastern districts of that province either at Shajehanpore or Bareilly. Among these dry country plants, are *Capparis aphylla* forming extensive jungles in the hottest parts of the Punjab, and found sparingly at Lucknow. *Corchorus depressus*, Linn. a native of the Arabian deserts, occurring in the Punjab, near Agra, and also at Lucknow. *Alhagi Maurorum*, the camel thorn of the desert, a peculiarly dry country plant common in the Punjab, which I found at Lucknow and traced along the sandy patches to Cawnpore where it was observed many years ago by General Hardwicke. *Berthelotia lanceolata* found formerly by Genl. Hardwicke at Cawnpore, and not known elsewhere east of the Jumna except at Lucknow.

Most of these plants are also found in the Deccan, where the climate is similar to that of the dry parts of the Punjab, and the North Western Provinces.

This peculiar Flora does not extend much beyond Lucknow in any direction, except towards Cawnpore. At Nawabgunge, eighteen miles to the east of Lucknow, it ceases, on the north it extends twenty or thirty miles, and on the west, only six or seven. This prolongation of the dry climate and desert Flora of India into the richly cultivated and well-watered province of Oude is interesting

and at the same time difficult to account for. The want of meteorological observations precludes the possibility of any reason being assigned, and causes us for the present to remain contented with the fact. Dr. Thomson suggests as a possible explanation, a depression in the chain of the Himalaya, north of Lucknow, which would cause a diminished rainfall and consequently a drier climate. Our knowledge of the topography of Nipal is, however, so limited that this suggestion cannot be tested by a reference to maps or altitudes.

In all parts of India, but especially in the North Western Provinces, there is, as I have already said, a large and diversified non-indigenous Flora. To a young botanist, these plants are most perplexing and it is not for several years that he is able to distinguish the truly wild species of his district from those that have been introduced. In no book has this character of the Flora of Northern India, received sufficient prominence; even Dr. Royle, in his *Illustrations of Indian Botany*, only refers to it incidentally. The descriptive works on botany that exist only serve to increase his confusion, as many of the species are included in these works from the fact of their being natives of the Himalayan or South Indian forests. It seems therefore desirable to accompany the catalogue of the indigenous species by some notice of the cultivated and introduced plants, and in so doing, I shall distinguish as much as possible between those species which are cultivated on a large scale, as field crops, and these found only in gardens, or orchards.

In all climates, plants cultivated for the use of man have an important influence on the physical aspect of the country. In temperate regions, where cereal grains and other annual species form the crops, there is wanting that luxuriance and diversity of form which are given to the tropical landscape by a cultivation composed of the economic palms, plantains, perennial Euphorbiaceæ, and tall annual grasses and leguminosæ. Northern India, with its widely different seasons, yielding at different periods of the year the products of the temperate, as well as of the torrid zone, presents, in a considerable degree, the physical appearance of both.

The cultivation of Upper India may be divided into three periods corresponding to the seasons of the year.

First—the season of wheat and vetch cultivation, extending over

the cold season, the harvest occurring in the end of March and first week of April. Second—the season of cucurbitaceous cultivation, lasting from the harvest of the first season to the beginning of the rains. Third—the season of tropical grains and leguminosæ, commencing with, and lasting through the rainy season.

I.—*The season of Wheat and Vetch cultivation.*

In the beginning of October, when the rains have subsided, the ground is rapidly prepared for the reception of the cold season crops, by its surface being several times turned over, by means of the rude native plough; the seed is sown in shallow furrows, and the ground smoothed by a log of wood being dragged over it by a pair of bullocks, the driver standing on the log, to steady its progress and increase its weight. From the dryness of the climate after October, irrigation forms an important part of the agriculture of the cold weather, and the fields are flooded with water several times during this period. The water is obtained either from wells, or natural ponds of water.

In the valley of the Goomtee, the water is near the surface, and is easily raised by an earthen vessel, attached by a short rope to the end of a pole so fastened to an upright post, as to admit of the end to which the vessel is secured, being lowered into the well, while the other extremity, which is loaded with a stone or mass of clay, lessens the force required to raise the bucket when filled with water. The principle is that of a lever, the resistance to be overcome, being the bucket full of water, the fulcrum, the points of attachment of the pole to the upright post, and the power, the loaded extremity, to which a man also adds his weight. Two men are required, one, to raise and lower the bucket, and another, to empty the water into the trough, from which the field is watered. On the land above the valley of the river, the wells require to be sunk below the kunker beds. There the water is obtained by means of bullocks raising a large leathern bucket or basket, attached to a strong rope of untanned hide passed over a large wheel, fixed over the well. The bullocks to lessen their labour work on a greatly inclined plane the length of the rope. The wells are often eighty feet deep, and contain cold, good water. I have never observed the Persian wells in Oude, though they occur at Cawnpore, and commonly, north-west of Meerut and Delhie.

From the tanks or ponds, the fields are irrigated by the water being raised to the necessary height, by rude locks which are alternately filled, and emptied, by means of closely worked wicker baskets, with ropes attached, held at arm's length, between two men. From the highest lock, the water ramifies in water-courses all over the fields. The species of plants cultivated are numerous, and consist almost entirely of those of temperate regions and which probably have been established in Northern India for many ages. The following list, though professedly including only the plants found near Lucknow, from the extensive distribution of the wheat and vetch cultivation over Northern India, comprises in reality nearly all the species, cultivated in the cold season, in the countries north-west of the Soane to the Indus.

*Cultivated plants of the cold season.*

*Papaver somniferum*, Linn.

*Lepidium sativum*, Linn. Cultivated in gardens and near wells in fields.

*Eruca sativa*, Lam. } Largely cultivated for their oil yielding seeds.  
*Sinapis juncea*, Linn. }

*Brassica Napus*, Linn.

———— oleracea var. *B. vulgaris*, D C.

———— var. *F. Botrytis a cauliflora*, D C.

*Raphanus sativus*, Linn.

*Linum usitatissimum*, Linn. Cultivated only for the oil yielded by its seeds.

*Trigonella fœnugræcum*, Linn. Seeds used as a condiment in curry.

*Cicer arietinum*, Linn. Gram, of Europeans; a white flowered and large-white seeded variety is cultivated at Lucknow under the name of Kaboolee chunna.

*Medicago sativa*, D C. Cultivated very sparingly by the natives, as fodder for horses.

*Vicia Faba*, Linn.

„ *Lens.*

„ *sativa*, Linn.

*Lathyrus sativus*, Linn.

*Pisum sativum*, Linn.



*Ligustium ajowain*, Roxb.

*Fœniculum vulgare*, Gartn.

*Daucus carota*, Linn.

*Coriandrum sativum*, Linn.

*Anethum sowa*, Roxb.

*Pimpinella involucrata*, W A.

*Carthamus tinctorius*, Linn.

*Solanum tuberosum*, Linn.

*Nicotiana Tabacum*, Linn.

*Capsicum annuum*, Linn.

*Plantago Isphagula*, Roxb. Cultivated for its demulcent seeds.

——— Major. Cultivated at Lucknow for its seeds, which are used as food for birds.

*Beta Bengalensis*, Roxb.

*Ricinus communis*, Linn.

*Cannabis sativa*, Linn.

*Allium sativum*, Linn.

——— Porrum, L.

——— Ascalonum, L.

——— Cepa, L.

*Hordewow hexastichon*, L.

*Triticum vulgare*, Willd.

——— var. *aestivum*. An awned and an awnless variety, are cultivated.

*Panicum miliaceum*, Willd.

From the custom of sowing several species together, or in alternate furrows, the fields present brighter, and more diversified hues, than they do in countries where agriculture has made greater advances. Within the limit of a few acres are often to be found, *Sinapis juncea*, *Eruca sativa*, *Brassica napus*, and *Linum usitatissimum*; with *Carthamus tinctorius* in one of the corners, or occupying one of the furrows, and near the well and shaded by a fig, moringa or neem tree, *Lepidium sativum*, *Fœniculum vulgare*, *Coriandrum sativum*, *Trigonella fœnugræcum* and one or two of the species of *Allium*. The leguminosæ of the cold season are also generally grown together; near Lucknow, I have noticed in one field *Pisum sativum*, *Ervum lens*, *Vicia sativa*, *Lathyrus sativus* and

*Cicer arietinum*. The borders of the field, where they are contiguous to a footpath or road, are often lined by plants of castor-oil or *Sesbania Ægyptica*, in a single row, with *Lablab vulgare* and *cultratum* twining round their stems. As the natives seldom clean the seeds before sowing them, weeds spring up abundantly with all the crops, and are left almost unmolested. The commonest of these are *Argemone mexicana*, *Fumaria officinalis*, var. *Vaillantii*, the species of *Sinapis* cultivated for economic purposes, *Saponaria vaccaria*, *Medicago denticulata* and *lupulina*, *Melilotus parviflora*, *Phalaris canariensis*, *Cichorium Endivia*, *Convolvulus arvensis*, *Anagallis arvensis*,  $\beta$ , *cærulea*, *Chenopodium album* and *hybridum*, *Asphodelus clavatus*, and in wheat and barley fields, *Avena fatua* and *Lolium temulentum*.

## II.—The season of Cucurbitaceous cultivation.

This season commences at the return of the hot weather in the beginning of April, contemporaneously with the harvest of the cold season crops. The most characteristic plants are *Cucurbita citrullus*, *Cucumis melo*, *momordica*, and *utilissimus*, which are extensively cultivated until the rains. During this season, the mango ripens its fruit, also *Grewia Asiatica*, *Mimusops Kanki*, and *Artocarpus integrifolius*. These Cucurbitaceæ are most successfully cultivated on the sandy beds of rivers, and on low lying ground, which from being under water during the rains, is not available for the crops of that period.

The following species I observed, commonly cultivated in Oude, in April, May and June.

### *Cucurbitaceæ.*

- Cucurbita Citrullus, Linn,
- maxima, Duch.
- Pepo, Linn.
- Lagenaria vulgaris, Ser.
- Cucumis melo, Linn.
- momordica, Roxb.
- sativus, Linn.
- utilissimus, Roxb.
- Luffa pentandra, Roxb.
- acutangula, Roxb.

*Momordica Charantia*, L.

*Trichosanthes anguina*, L.

In the fields and waste places, several of the weeds found among the crops of the cold weather, still exist, with the addition of several species almost peculiar to this season; such as, *Sida retusa*, *Sida humilis*, *Corchorus trilocularis*, *Tribulus terrestris*, *Crotalaria neglecta*, *Cyanopsis psoraloides*, *Spermacoce hispida*, *Vernonia cinerea*, several species of *Blumea*, *Vicoa Indica*, *Francoecuria crispa*, *Echinops echinatus*, *Cirsium Wallichii*, *Microdonchus divaricatus*, *Campanula canescens*, *Trichodesma Indicum*, *Celsia Coromandeliana*, one or two species of *Leucas*, *Physalis flexuosa*, and several grasses, of which *Imperata arundinacea* and *Cenchrus echinatus* are the commonest.

III.—In the end of June, the occurrence of moist easterly winds occasional thunderstorms with slight showers are the first signs of the approach of the rainy season.

These first falls of rain are anxiously looked for, by the agriculturist, as they serve to soften the ground, scorched by the burning sun, and drought of the previous four months, and when they occur, he loses no time in preparing the soil, for the reception of the "kurreef" or rain crop. In the beginning of July, the rains have become quite established, and their vivifying influence is at once visible; the face of nature becomes completely altered, and everywhere, the earth is covered with a carpet of the richest green, composed of the strictly tropical cultivation of the season, and of tropical weeds, and tall grasses. The perennial plants, stunted by aridity and excessive heat, become so affected by the prevailing moisture, as to be difficult of recognition, and have thus given rise to many of the doubtful species of systematic works. These forms are most common among Leguminosæ, Compositæ, Labiatae and Acanthaceæ. Tropical grains and Leguminosæ form the majority of the cultivated species. The most conspicuous plants among them are *Hibiscus cannabinus*, with its purple-centred, yellow flowers. *Crotalaria juncea*, which in September, produces long terminal spikes of sweet smelling bright yellow flowers, so numerous, that the green of the leaves is obscured by the mass of blossom. Both these species yield a strong fibre, used in the manufacture of coarse paper, canvass, and cordage. Among the economic grasses, *Zea*

*mais*, the tall *Penicillaria spicata* and *Sorgum vulgare* are the most striking, so tall and so thickly planted are they that even on horse-back the view is obscured by them. Several species such as, *Paspalum frumentaceum*, *Eleusine coracana*, yield grains little known to Europeans. They are used by the poorer natives, but so inferior is the nourishment they afford, that sloughing of the cornea, and other diseases of debilitated constitutions are ascribed to their use.

Tropical weeds, of the orders Lythraceæ, Leguminosæ, Convolvulaceæ, Scrophulariaceæ, Acanthaceæ, Amaranthaceæ, Commelynaceæ, are abundant. Among them are the various species of *Ameletia*, and *Ammannia*, *Crotalaria sericea* and *mysorensis*, *Cassia pumila*, *Mucuna prurita*, *Rhyncosia* and *Desmodium*, *Ipomoea pestigridis sessiliflora* and *pilosa*, *Bonnaya serrata* and *veronicæfolia*, *Herpestes monniera*, *Striga densiflora*, *Digera arvensis*, *Amaranthus spinosus*, *Achyranthes lappacea*, *Commelina communis* and *Benghalensis*. *Anileima nudiflorum*, several cyperaceæ and gramineæ, principally of the genera *Panicum*, *Eleusna*, and *Andropogon*. The rains cultivation of India being widely diffused, the following list of Lucknow plants consists of species found nearly all over India.

#### *Cultivated Rains Plants.*

*Hibiscus cannabinus*, L.

———— *sabdariffa*, L. In gardens only, introduced from the W. Indies.

*Abelmoschus esculentus*, W. and A.

*Gossypium herbaceum*, L. Produces two crops in the year, one at the end of the rains, another in April.

*Crotalaria juncea*, L. Largely cultivated for its fibre.

*Indigofera tinctoria*, L.

*Phaseolus lunatus*, L. In gardens only.

———— *Mungo*, L.

———— *radiatus*, Roxb.

———— *aconitifolius*, Jacq.

*Dolichos sinensis*, L. Three varieties with white, brown, and black seeds respectively.

*Lablab vulgare*, Savi. Several unimportant varieties.

———— *cultratum*, D C. This species with *L. vulgare*, though rains plants, are to be found in fruit all through the cold season, though otherwise then nearly dormant.

*Canavalia gladiata*, D C. Common in gardens and near native houses.

*Mucuna capitata*, W. and A. In gardens only.

*Batatas edulis*, Choisy.

*Solanum Melongena*, L.

*Lycopersicum esculentum*, Mill.

*Piper Betle*, L. It is extensively cultivated at some villages near Bunnee, eighteen or twenty miles from Lucknow.

*Amaranthus polygamus*, L.

———— *oleraceus*, L.

———— *gangeticus*, L.

*Basella alba*, L.

*Zingiber officinale*, Roscœ.

*Curcuma longa*, Roxb.

*Dioscorea alata*, L.

*Colocasia antiquorum*, Schott.

*Zea mays*, L.

*Oryza sativa*, L.

*Paspalum scorbiculatum*, L.

*Oplismenus frumentaceus*, Roxb.

*Pennisetum italicum*, R. Br. *Setaria*, Beauv.

*Panicum miliaceum*, Willd.

*Penicillaria spicata*, Willd.

*Sorghum vulgare*, Pers.

*Saccharum officinarum*, L. Flowers in the rainy season, but the crop is not cut until the end of the cold weather.

*Eleusine coracana*, Gartn.

———— *stricta*, Roxb.

IV. The long established plants of the native gardens, the fruit and common ornamental trees of Northern India form the last portion of the vegetation of Lucknow, to which I shall advert, before detailing the indigenous Flora.

In European gardens, are to be found in the cold season, most of the annuals, common in gardens in England, and several of them have become favorites with the natives, but I shall pass them over as they are here without interest to the botanical student. These plants of native gardens have probably been cultivated for many gener-

ations, the origin of several is doubtful, many of them are indigenous in some part of India, either north or south, some have been introduced from Persia and the oriental region, and a few cosmopolitan species seem to have been imported by the different conquerors of the country. They spring up often on rubbish heaps, or by the wayside and near villages and towns, and are thus apt to be gathered and included in the Flora of the district. Out of the list appended, those most worthy of notice are. *Cheiranthus cheiri*, *Hibiscus mutabilis*, *Guatteria longifolia*, which probably here reaches its northern limit as it seldom or never flowers, and is nearly deciduous; *Cookia punctata*, *Eriobota Japonica*, *Pyrus sinensis*, are common in the gardens of the Nawabs. *Ananus sativus* succeeds well, though not extensively cultivated. A few trees of *Cocos nucifera* exist at Lucknow, though the climate is utterly unsuited for them. Lofty trees of *Ailanthes excelsa*, a tree rare north of the Jumna, occur very commonly at Lucknow.

*List of cultivated plants and trees of the native gardens and orchards or "baghs."*

*Ranunculaceæ.*

*Delphinium ajacis*, L.

*Magnoliaceæ.*

*Michelia champaca*, L.

*Anonaceæ.*

*Guatteria longifolia*, Wall.

*Anona squamosa*, L.

—— *reticulata*, L.

*Papaveraceæ.*

*Papaver somniferum*, L. Several garden varieties.

—— *dubium*, L.

—— *Rhœas*, L.

*Crucifercæ.*

*Cheiranthus Cheiri*, L.

*Caryophyllaceæ.*

*Dianthus chinensis*, L.

*Linaceæ.*

*Linum trigynum*, Roxb.

*Malvaceæ.*

*Malva sylvestris*, L.

*Althaea rosea*, Cav.

*Hibiscus Rosa sinensis*, L.

——— *mutabilis*, L.

*Bombaceæ.*

*Bombax malabaricum*, D C.

*Byttneriaceæ.*

*Pentapetes phoenicea*, L.

*Tiliaceæ.*

*Grewia asiatica*, L.

*Aurantiaceæ.*

*Bergera Konigii*, L.

*Citrus decumana*, L. The pumelo.

——— *Aurantium*, L. The orange.

——— *Bergamia*, Risso. The common acid lime.

——— *Limetta*, Risso. The sweet lime.

——— *medica*, L. Common citron.

*Sapindaceæ.*

*Sapindus emarginatus*, Vahl. Cultivated near villages in Oude.

*Nephelium Lichi*, W. and A. Cultivated in the gardens of Nawabs and at the old cantonment of Lucknow.

*Meliaceæ.*

*Melia Azedarach*, L.

——— *sempervirens*, Roxb. Is it merely a variety?

*Azadirachta indica*, Ad. Juss.

*Ampelideæ.*

*Vitis vinifera*, L.

*Balsamineæ.*

*Impatiens Balsamina*, L.

*Oxalidaceæ.*

*Averrhoa carambola*, L.

*Rutaceæ.*

*Ruta angustifolia*, Pers.

*Zanthoxylaceæ.*

*Ailanthus excelsa*, Roxb.

## CALYCIFLORÆ.

*Rhamnaceæ.*

*Zizyphus jujuba*, Lam.

———— *vulgaris*, Lam.

*Terebinthaceæ.*

*Mangifera indica*, L.

*Moringeæ.*

*Moringa pterygosperma*, Gärtn.

*Leguminosæ.**Papilionaceæ.*

*Clitoria Ternatea*, L.

*Sesbania aegyptica*, Pers.

*Erythrina indica*, Lam.

*Dalbergia Sisso*, Roxb.

*Mimoseæ.*

*Mimosa pudica*, L.

*Acacia serissa*, Buch.

*Guilandina Bonduc*, Ait. hort. Kew.

*Poinciana pulcherrima*, L.

*Parkinsonia aculeata*, L.

*Tamarindus indica*, L.

*Cassia Fistula*, L.

———— *suffruticosa*, Kön.

———— *auriculata*, L.

———— *occidentalis*, L.

*Bauhinia variegata*, L.

var *purpurea*.

— *candida*.

*Bauhinia purpurea*, L.

*Bauhinia pariflora*, Vahl.

*Rosaceæ.*

*Amygdalus Persica*, L.

———— var *nectarina*.

———— *cordifolia*, Roxb. The flat China peach.

*Prunus triflora*, Roxb.

*Rosa indica*, L.



*Rosa centifolia*, L. Cultivated for the manufacture of rose-water and ottar of roses.

*Eriobotrya Japonica*, Lindl. Sparingly cultivated at Lucknow.

*Pyrus sinensis*, Lindl. Common in the larger native gardens.

*Granataceæ.*

*Punica granatum*, Linn.

*Lythraceæ.*

*Lawsonia alba*, Lam.

*Lagerstroemia indica*, Linn.

*Myrtaceæ.*

*Psidium pyriferum*, Linn.

——— *pomiferum*, Linn.

*Eugenia Jambos*, L.

——— *Jambolana*, Lam.

*Papayaceæ.*

*Carica Papaya*, L.

*Crassulaceæ.*

*Bryophyllum calycinum*, Salisb.

*Cactææ.*

*Opuntia Dillenii*, Hard.

*Rubiaceæ.*

*Nauclea cordifolia*, Roxb.

*Gardenia florida*, L.

*Morinda citrifolia*, L.

*Hamiltonia suaveolens*, Roxb.

*Ixora coccinea*, L.

*Compositææ.*

*Callistephus chinensis*, Nees.

*Helianthus annuus*, L.

——— *tuberosus*, L.

*Tagetes patula*, L.

——— *erecta*, L.

*Chrysanthemum indicum*, L.

——— *sinense*, Sabin.

*Artemisia indica*, Willd.

*Calendula officinalis*, L.

Amberboa indica, D C.

————— moschata, D C.

Centaurea Cyanus, L.

Cichorium Endivia, Willd. Cultivated in gardens, and springing up spontaneously with the cold weather crops.

#### COROLLIFLORE.

##### *Ebenaceæ.*

Diospyros tomentosa, Roxb.

##### *Sapotaceæ.*

Bassia latifolia, Roxb. At Lucknow and throughout Oude spirit is distilled from the flowers.

Mimusops Kauki, L.

##### *Jasmineæ.*

Jasminum pubescens, Willd.

————— revolutum, Sims.

————— grandiflorum, L.

Nyctanthes arbor tristis, L.

##### *Apocynaceæ.*

Nerium odoratum, Lam.

Vinca rosea, L.

Tabernaemontana coronaria, R. Br.

Plumiera acuminata, Ait.

Allavoranda cathartica, L.

Carissa carandas, L.

Thevetia nereifolia, Juss.

##### *Bignoniaceæ.*

Millingtonia hortensis, L.

##### *Sesameæ.*

Martynia diandra, Glox.

##### *Convolvulaceæ.*

Argyrea speciosa, Swt.

Quamoclit phœniceum, Choisy.

————— vulgare, Choisy.

var album.

Pharbitis Nil, Choisy. Cultivated in gardens and also apparently wild near Lucknow.

————— cœrulescens, Choisy.

*Calonyction muricatum*, G. Don.

*Convolvulus purpureus*, L. Several inconstant varieties are described, named from the colour of the flowers.

*Cordiaceæ.*

*Cordia Myxa*, L. Commonly planted by road sides.

*Scrophulariaceæ.*

*Russelia juncea*, Zucc.

*Acanthaceæ.*

*Barleria Prionitis*, L. Wild, but also cultivated in gardens.

*Verbenaceæ.*

*Vitex Negundo*, L. Wild, but also cultivated on account of its sweet smelling flowers.

*Vitex incisa*, Lam. Cultivated at Lucknow.

*Gmelina asiatica*, L. Cultivated in an orchard at the village of Onnao near Lucknow.

*Labiataæ.*

*Ocimum sanctum*, L. Cultivated as a sacred plant by the Hindoos.

*Mentha viridis*, L.

*Solanaceæ.*

*Physalis peruviana*, Linn. Cultivated for the sake of its acid berries.

*Amarantaceæ.*

*Celosia cristata*, L.

*Gomphrena globosa*, L.

*Nyctagineæ.*

*Mirabilis jalapa*, L.

*Santalaceæ.*

*Santalum album*, L. Occurring frequently near Hindoo villages, but always planted.

*Euphorbiaceæ.*

*Emblica officinalis*, Gartn.

*Cicca disticha*, L.

*Jatropha curcas*, L.

*Euphorbia antiquorum*, L.

————— *Tiraculli*, L.

*Pedilanthus tithymaloides*, Poit.

} Planted near villages as hedge plants.

*Urticaceæ.*

*Morus lævigata*, Wall. Black mulberry.

—— *cashmeriana*, Royle. Long white fruited mulberry.

*Ficus Carica*, L.

—— *indica*, L. { Generally planted in North Western India,  
—— *religiosa*, L. { though both spring up spontaneously  
everywhere.

*Artocarpus integrifolius*, L.

*Amentaceæ.*

*Salix babylonica*, L.

*Conifereæ.*

*Thuja orientalis*, L.

*Cupressus sempervirens*, L.

## ENDOGENÆ.

*Marantaceæ.*

*Canna indica*, L.

*Iridaceæ.*

*Iris chinensis*, Curt. Probably introduced from China, common in native gardens.

*Amaryllideæ.*

*Crinum asiaticum*, L.

—— *latifolium*, Roxb.

*Pancratium Zeylanicum*, L.

*Agave Cuntala*, Roxb. (a vivipara, Royle).

*Bromeliaceæ.*

*Ananas sativa*, L.

*Liliaceæ.*

*Hemerocallis fulva*, Linn.

*Polianthes tuberosa*, Linn.

*Palmeceæ.*

*Caryota urens*, L. Two trees, thirty feet in height, have been for many years in the "Char Bagh" garden.

*Borassus flabelliformis*, L. Commonly planted near Lucknow for the sake of its sap, and for the leaves from which larger fans are made.

*Cocos nucifera*, L. The cocoa nut palm has been planted in several of the gardens in and near Lucknow. The trees are forty and fifty feet high, and though full grown, they never flower.

*Pandanæ.*

*Pandanus odoratissimus*, L. Extensively cultivated on account of its powerfully fragrant flowers.

*Gramineæ.*

*Bambusa* ——— ?

This extensive introduced Flora, large though it is, increases in importance when considered with reference to the comparatively small number of really indigenous species. The truly wild plants probably amount to five hundred or six hundred species, and are most well known and widely distributed in India. None of them are rare, except *Kobautia gracilis*, Royle, a new species of *Trifolium*, *Gmelina asiatica*, and *Crypsis phleoides*.

Unfortunately my list is not so complete as it might be, for, as my original collections were lost during the mutinies, it has been compiled from a set of duplicates I sent to Dr. Thomson, and from a small collection I made, while on service at Lucknow last year. The truly wild species drawn from these materials exceed four hundred, though many of the rains plants, especially grasses, are wanting. *List of the indigenous plants of Lucknow.*

EXOGENÆ.

*Ranunculaceæ.*

*Ranunculus sceleratus*, L.

*Menispermaceæ.*

*Tinospora cordifolia*, Miers.

*Cocculus villosus*, D C.

*Cissampelos Pareira*, L.

*Nymphaceæ.*

*Nymphaea Lotus*, L.

————— *stellata*, Willd.

*Nelumbiaceæ.*

*Nelumbium speciosum*, Willd.

*Papaveraceæ.*

*Argemone Mexicana*, L.

*Fumariaceæ.*

*Fumaria parviflora*, Lam. Var *Vaillantii*.

*Cruciferæ.*

*Nasturtium palustre*, D C.

*Sisymbrium Irio*, L.

*Sinapis juncea*, L.

*Capparidaceæ.*

*Gynandropsis pentaphylla*, D C.

*Polanisia viscosa*, D C.

*Capparis horrida*, L.

———— *aphylla*, Roth.

*Flacourtiaceæ.*

*Flacourtia sapida*, Roxb.

*Violaceæ.*

*Ionidium suffruticosum*, Ging. Mss.

*Polygalaceæ.*

*Polygala arvensis*, Willd.

———— *Vahlana*, D C.

*Tamarascineæ.*

*Tamarix gallica*, L.

*Elatineæ.*

*Bergia ammannoides*, Roxb.

*Caryophyllaceæ.*

*Saponaria Vaccaria*, L.

*Silene conoidea*, L.

*Mollugo spergula*, L.

———— *pentaphylla*, L.

———— *nudicaulis*, Lam.

*Spergula pentandra*, L.

*Stellaria media*, Sm.

*Linaceæ.*

*Linum trigynum*, Roxb.

*Maloaceæ.*

*Malva rotundifolia*, L.

*Urena lobata*, L.

*Abelmoschus moschatus*, Moench.

*Abutilon indicum*, G. Don.

*Sida retusa*, L.

— *acuta*, Burm.

— *humilis*, Willd.

— *cordifolia*, L.

— *mysorensis*, Herb. Madr. in W. and A. Prod. Fl. ind.

*Byttneriaceae.*

*Melochia corchorifolia*, L.

*Waltheria indica*, L.

*Tiliaceae.*

*Corchorus depressus*, L.

— *trilocularis*, L.

— *olitorius*, L.

— *capsularis*, L.

— *acutangulus*, Lam.

*Aurantiaceae.*

*Glycosmis pentaphylla*, D C.

*Feronia elephantum*, Corr.

*Ægle marmelos*, Corr.

*Sapindaceae.*

*Sapindus emarginatus*, Vahl.

*Meliaceae.*

*Azadirachta indica*, Ad. de Juss.

*Oxalidaceae.*

*Oxalis corniculata*, L.

*Zygophyllaceae.*

*Tribulus terrestris*, L.

CALYCIFLORAE.

*Rhamnaceae.*

*Zizyphus Jujuba*, Lam.

*Zizyphus ænoplia*, Mill.

*Leguminosae.*

*Heylandia latebrosa*, D C.

*Crotalaria mysorensis*, Roth.

— *juncea*, L.

— *sericea*, Retz.

— *neglecta*, W. and A.

- Crotolaria luxurians*, Benth.  
*Medicago lupulina*, L.  
——— *denticulata*, Willd.  
*Melilotus leucantha*, Koch.  
——— *parviflora*, Desf.  
*Trigonella* (an. n. sp.)  
*Cyamopsis psoraloides*, D C.  
*Psoralea corylifolia*, L.  
*Indigofera linifolia*, Retz.  
——— *enneaphylla*, L.  
——— *tinctoria*, L.  
——— *hirsuta*, L.  
*Glycine labialis*, L.  
*Tephrosia purpurea*, Pers.  
*Sesbania ægyptica*, Pers.  
——— *aculeata*, Pers.  
*Zornia angustifolia*, Sm.  
*Aeschynomene indica*, L.  
*Uraria picta*, Den.  
*Desmodium gangeticum*, D C.  
——— *triflorum*, D C.  
——— *latifolium*, D C.  
*Alhagi maurorum*, Lour.  
*Alysicarpus monilifer*, D C.  
——— *nummularifolius*, D C.  
——— *vaginalis*, D C.  
——— *bupleurifolius*, D C.  
*Vicia hirsuta*, Koch.  
*Abrus precatorius*, L.  
*Rhynchosia medicaginea*, D C.  
*Mucuna prurita*, Hook. Wild, as well as cultivated.  
*Butea frondosa*, Roxb.  
*Dalbergia Sissoo*. Wild in jungly places near Lucknow.  
*Mimosa rubicaulis*, Lam.  
*Desmanthus natans*, Willd.  
*Acacia Farnesiana*, Willd.  
——— *Arabica*, Willd.



Guilandina Bonduc, L.

Cassia Sophora, L.

——— pumila, L.

——— Tora, L.

Bauhinia variegata, L. Doubtfully wild near Lucknow.

*Rosaceae.*

Potentilla supina, L.

*Lythraceae.*

Ameletia indica, D C.

Ammannia octandra, L.

——— vesicatoria, Roxb.

——— multiflora, Roxb.

——— pentandra, Roxb.

——— rotundifolia, Buch. Ham.

*Onagraridae.*

Jussiaea repens, L.

Ludwigia parviflora, Roxb.

Trapa bispinosa, Roxb.

*Haloragaceae.*

Myriophyllum spicatum, L.

*Cucurbitaceae.*

Bryonia scabrella, L.

——— laciniosa, L.

Coccinia Indica, W. and A.

Momordica Charantia, L.

Trichosanthes cucumerina, L.

*Portulacaceae.*

Trianthema crystallina, Vahl.

——— obcordata, Roxb.

——— pentandra, L.

Portulaca oleracea, L.

——— quadrifida, L.

*Paronychiaceae.*

Polycarpaea corymbosa, Lam.

Hapalosia Lœflingiae, Wall.

*Ficoideae.*

*Glinus lotoides*, L.

*Cacteae.*

*Cactus Indicus*, Roxb. Probably introduced into India from America.

*Saxifagaceae.*

*Vahlia viscosa*, Roxb.

*Umbelliferae.*

*Hydrocotyle asiatica*, L.

*Loranthaceae.*

*Loranthus longiflorus*, Desr.

*Rubiaceae.*

*Randia dumetorum*, Lam.

*Hedyotis Burmanniana*, Br.

*Bigelovia lasiocarpa*, W. and A.

*Spermacoce hispida*, L.

*Compositae.*

*Vernonia cinerea*, Less.

*Elephantopus scaber*, L.

*Sphaeranthus mollis*, Roxb.

*Grangea maderaspatana*, Poir.

*Berthelotia lanceolata*, D C.

*Blumea lacera*, D C.

—— *hieraciifolia*, D C.

—— *oxyodonta*, D C.

—— *aurita*, D C.

*Inula vestita*, Wall.

*Vicoa indica*, D C.

*Francoeuria crispa*, Cass.

*Caesulia axillaris*, Roxb.

*Eclipta prostrata*, L.

*Blainvillea latifolia*, D C.

*Xanthium sturmairium*, L. I can find no distinctive characters between European and Indian specimens of this species, so marked or constant as to constitute *X. indicum* Roxb.

*Bidens decomposita*, Wall.

- Chrysanthellum Indicum*, D C.  
*Glossogyne pinnatifida*, D C.  
*Matricaria Chamomila*, L.  
*Artemisia Indica*, Willd.  
*Myriogyne minuta*, Less.  
*Machlis hemisphærica*, D C.  
*Filago prostrata*, D C.  
*Gnaphalium luteoalbum*, L.  
 ———— *crispatum*, Delil.  
 ———— *Indicum*, L.  
*Emilia sonchifolia*, D C.  
*Echinops echinatus*, Roxb.  
*Microdonchus divaricatus*, D. C.  
*Cirsium Wallichii*, D C.  
*Microrhynchus nudicaulis*, Less.  
 ———— *asplenifolius*, D C.  
*Sonchus oleraceus*, L.

*Campanulaceae.*

- Campanula canescens* Wall.

COROLLIFLORÆ.

*Lentibulariaceae.*

- Utricularia stellaris*, L.

*Primulaceae.*

- Anagallis arvensis*, L.

*Jasmineac.*

- Jasminum Sambac*, Ait.

*Apocynaceae.*

- Carissa edulis*, Vahl.

- Vinca pusilla*, Murr.

*Asclepiadaceae.*

- Calotropis gigantea*, R. Br.

- *procera*, R. Br.

- Pergularia pallida*, W. and A.

- Gymnema sylvestre*, R. Br.

*Gentianaceae.*

- Erythraea Roxburghii*, Don.

*Slevogtia orientalis* Griseb.

*Limnanthemum cristatum*, Griseb.

*Hydrophyllaceae.*

*Hydrolea Zeylanica*, Vahl.

*Convolvulaceae.*

*Batatas pentaphylla*, Chois.

*Pharbitis Nil* Chois.

*Ipomœa reptans*, Poir.

—— *Pes tigridis*, L.

—— *pilosa*, Sw. h. sub. 2nd ed. p. 289.

—— *sessiliflora*, Roth.

—— *cymosa*, R. et Sch.

—— *sepiaria*, Koen.

*Convolvulus pluricaulis*, Chois.

—— — *arvensis*, L.

*Evolvulus alsinoides*, L.

*Cuscuta reflexa*, Roxb.

*Borragineae.*

*Cordia Rothii*, Roem. et Sch.

*Ehretia laevis*, Roxb.

—— *aspera*, Roxb.

*Heliotropium Europæum*, L.

—— — *brevifolium*, Wall.

*Arnebia hispidissima*, D C.

*Cynoglossum frucatum*, Wall.

*Trichodesma indicum*, R. Br.

*Scrophulariaceae.*

*Verbascum Thapsus*, L.

*Celsia coromandeliana*, Vahl.

*Antirrhinum orontium*, B. indicum, Benth.

*Lindenbergia urticæfolia*, Lehm.

*Limnophila gratioloides*, R. Br.

*Herpestes Hamiltoniana*, Benth.

—— *monniera*, Humb. and Kunth.

*Dipatrium junceum*, Ham.

*Hysanthes parviflora*, Benth.

- Bonnaya brachiata, Link.  
 ——— parviflora, Benth.  
 ——— verbenaeifolia, Spreng.  
 ——— veronicaefolia, Spreng.  
 Mazus rugosus, Lur.  
 Veronica anagallis, L.  
 ——— agrestis, L.

*Orobanchaceae.*

- Phelipaea indica, G. Don.

*Acanthaceae.*

- Ruellia latebrosa, Roxb.  
 ——— ringens, Roxb.  
 Dipteracanthus dejectus, Nees ab Esen.  
 Barleria cristata, L.  
 ——— Prionitis, L.  
 Asteracantha longifolia, Nees ab Esen.  
 Rostellaria procumbens, Roxb.  
 Rostellaria ———.  
 Adhatoda Vatica, Nees ab Esen.  
 Rungia pectinata, Nees ab Esen.  
 ——— repens, Nees ab Esen.  
 Peristrophe bicalyculata, Roxb.  
 Andrographis paniculata, Nees ab Esen.

*Verbenaceae.*

- Verbena officinalis, L.  
 Lippia nodiflora, Rich.  
 Gmelina asiatica, L.  
 Vitex negundo, L.

*Labiatae.*

- Ocimum Basilicum, glabratum, Benth.  
 ——— inodorum, Koen.  
 Salvia plebeia, R. Br.  
 Nepeta ruderalis, Hamilt.  
 Anisomeles ovata, R. Br.  
 Leucas zeylanica, R. Br.  
 ——— aspera, Spreng.

*Leucas cephalotes*, Spreng.

*Leonotis nepetaefolia*, R. Br.

*Solanaceae.*

*Solanum nigrum*, L.

———— *verbascifolium*, L.

———— *Jacquini*, Willd.

*Physalis minima*, L.

———— *flexuosa*, L.

*Datura alba*, Nees ab Esen.

———— *fastuosa*, L.

*Hyoscyamus niger*, L.

*Amarantaceae.*

*Desmochaeta atropurpurea*, D C.

———— *muricata*, D C.

*Digera arvensis*, Forsk.

*Alteranthera sessilis*, R. Br.

*Aerva javanica*, Juss.

*Celosia argentea*, L.

*Achyranthes aspera*, L.

———— *lappacea*, L.

*Amarantus spinosus*, L.

———— *oleraceus*, L.

———— *polygamus*, L.

———— *polygonoides*, L.

———— *tenuifolius*, Willd.

*Nyctagineae.*

*Boerhaavia diffusa*, L.

*Polygonaceae.*

*Rumex acutus*, Roxb.

*Polygonum Roxburghii*, Meisn.

———— *flaccidum*, Roxb.

———— *glabrum*, Willd.

———— *lanigerum*, R. Br.

*Chenopodiaceae.*

*Chenopodium album*, L.

———— *hybridum*, L.

*Salvadora persica*, L. non Wight.

*Euphorbiaceae.*

- Euphorbia Helioscopia*, L.  
——— *dracunculoides*, Lam.  
——— *hirta*, L.  
——— *thymifolia*, Roxb.  
——— *parviflora*, Roxb.  
*Crozophora tinctoria*, A. Juss.  
——— *plicata*, A. Juss.  
*Phyllanthus Niruri*, L.  
——— *simplex*, L.  
*Flüggea retusa*, Roxb.

*Urticaceae.*

- Trophis aspera*, Retz.  
*Ficus caricoides*, Roxb.

*Stilaginaceae.*

- Antidesma diandra*, Heyne.

*Amentiferae.*

- Salix tetrasperma*, L.

## ENDOGENÆ.

*Orchidaceae.*

- Zeuxine sulcata*, Lindl.

*Hydrocharideae.*

- Hydrilla verticillata*, Rich.

*Palmaceae.*

- Phoenix sylvestris*, Roxb.

*Liliaceae.*

- Asparagus racemosus*, Willd.  
*Asphodelus fistulosus*, L.  
*Gloriosa superba*, L.

*Commelynaceae.*

- Commelyna communis*, L.  
——— *Bengalensis*, Roxb.  
*Aneilema nudiflora*, Kunth.

*Juncaceae.*

*Juncus bufonius*, L.

*Typhaceae.*

*Typha elephantina*, Roxb.

*Lemnaceae.*

*Lemna orbicularis*, Roxb.

*Potamogetonaceae.*

*Potamogeton indicus*, Roxb.

*Resticeae.*

*Eriocaulon quinquangulare*, Linn.

*Cyperaceae.*

*Carex Wallichianus*, Pres.

*Fimbristylis communis*, Kunth.

*Isolepis barbata*, R. Br.

——— *supina*, R. Br.

——— *lupulina*, Nees in Wight.

——— *squamosa*, Vahl.

*Scirpus mucronatus*, L.

——— *maritimus*, L.

——— *grossus*, Vahl.

*Eleocharis palustris*, R. Br.

*Kyllingia monocephala*, L.

——— *triceps*, L.

*Mariscus dilutus*, Nees ab Esen.

*Cyperus distans*, L.

——— *Irio*, L.

——— *rotundus*, L.

——— *difformis*, L.

——— *racemosus*, L.

——— *rotundus*, L.

——— *pumilus*, L.

——— *niveus*, Retz.

——— *compressus*, L.

——— *mucronatus*, Rottb.

——— *pygmaeus*, Vahl.



*Gramineae.*

- Oryza sativa*, L.  
*Zizania aristata*, Kunth.  
*Coiz Lachryma*, L.  
*Crypsis schoenoides*, Lam.  
*Phalaris canariensis*, L.  
*Alopecurus agrestis*, L.  
*Setaria glauca*, Bearw.  
*Panicum colonum*, Linn.  
 ————— *paludosum*, Roxb.  
 ————— *maximum*.  
 ————— *spicatum*, Roxb.  
 ————— *umbrosum*, Retz.  
 ————— *verticillatum*, Linn.  
 ————— *uliginosum*, Roxb.  
 ————— *cinneinum*, Retz.  
 ————— *repens*, Roxb.  
 ————— *Burmanni*, Retz.  
*Digitaria sanguinalis*, Scop.  
*Lappago racemosa*, Willd.  
*Pennisetum cenchroides*, Rich.  
 ————— n. sp. ?  
*Cenchrus echinatus*, Linn.  
*Aristida setacea*, Retz.  
*Pragmites karka*, Kunth.  
*Arundo bifaria*, Retz.  
*Cynodon Dactylon*, Pers.  
*Dactyloctenium ægypticum*, Willd.  
*Chloris barbata*, Swartz.  
*Leptochloa tenerrima*, Roen.  
*Eleusine indica*, Gaert.  
 ————— *verticillata*, Roxb.  
*Lolium temulentum*, L.  
*Avena fatua*, L.  
*Poa tenella*, L.  
 ————— *annua*, L.  
 ————— *flexuosa*, Roxb.

- Poa cynosuroides*, Retz.  
—— *viscosa*, Retz.  
*Eragrostis poæformis*, Link.  
—— *verticillaris*.  
—— *nutans*, Nees.  
—— *interrupta*, Nees.  
—— *Koenigii*.  
*Perotis latifolia*, Ait.  
*Saccharum spontaneum*, L.  
*Imperata arundinacea*, Cyr.  
*Apluda aristata*, Linn.  
*Andropogon involutus*, Steud.  
*Heteropogon contortus*, Pers.  
*Cymbopogon Iwarancusa*, Roxb.

## CRYPTOGAMÆ.

*Marsileaceae.*

- Marsilea quadrifolia*, L.  
*Azolla pinnata*, L.

*Equisetaceae.*

- Equisetum arvense*, L.
-

*The S'ri-sukta, or Litany to Fortune; text and commentary, with translation.—By FITZ-EDWARD HALL, M. A.*

The period is now rapidly approaching when the contents of the Vedas and of their principal appendages will be unfolded. Among these appendages there is, however, at least one class of writings, not altogether devoid of interest, which an investigator labouring on Indian soil may, perhaps, treat of with less difficulty, if not more satisfactorily, than a scholar restricted to the limited appliances of Europe. I refer to the Vaidika intercalations known by the name of *khila*, *paris'ishṭa*, or, still oftener, with whatever correctness, *padas'ishṭa*. In rare instances do we meet with two manuscripts, unless one is punctually reproduced from the other, in which the incorporations of this stamp correspond throughout. Even as for the *Rig-veda*, numerous transcripts of it must be inspected before we can assure ourselves that we have exhausted the more ordinary apocryphal passages with which that collection is interspersed. At any rate, a careful examination of fifteen copies of it has conducted me to this conclusion.

Data are scarcely yet brought to light that would authorize one in pronouncing on the age and origin of the interpolations in the primitive Hindu scriptures, which I here contemplate. To turn, for a moment, from the Veda proper, we have, for a *khila*, the *Hari-vans'a*, a supplement to the *Mahábhárata*, and yet certainly not contemporaneous with the main poem. Undoubtedly it is later. On the other hand, of the *khilas* inserted in the *Rig-veda*, while many are, without question, of comparatively modern date, there are a few, among those not traceable to other Vedas, which discover, to some extent, characteristics of archaism. If not very good imitations, they must, then, be accounted genuine relics of antiquity. The traditional, but sufficiently uncritical, belief of the pandits, as touching the Vaidika *khilas*, is, that they are excerpts, one and all, from branches of the Veda no longer extant in their integrity.\*

\* In Central India, at all events, females of Bráhmanical descent are allowed to read the *Vaidika khilas*, with their *phala-s'rutis*, and those of sacred hymns generally. A *phala-s'ruti* is an appendant text of scripture, importing, in strict-

That some of them are ancient, we have so good an authority as the compiler of the Laws of the Mánavas ;\* and Yáska, while citing a fragment of a *khila*, does not afford the slightest indication that it was regarded, in his age, as spurious, or even as deutero-canonical.† A dissertation of a recent speculator would impress the conviction, which is commonly entertained by the Hindus, that the *S'ri-sūkta* was once comprehended in some portion, now lost, of the *Atharva-veda*.‡

ness, the benefit to be derived from repeating the words to which it is attached.

Oblivion or disregard is, however, manifested, in this permission, of the familiar declaration :

स्त्रीशूद्रद्विजबन्धूनां त्रयी न श्रुतिगोचरा ।

इति भारतमाख्यानं व्यासेन मुनिना कृतम् ।

‘ Women, serviles, and merely titular Bráhmans are not to listen to the three Vedas. Hence was the history of the *Bhárata* devised by Vyása the holy sage.’

\* III., 232. Kullúka Bhaṭṭa instances, in exemplification of a *khila*, a *S'ri-sūkta* ; the very one, it may be, now published. In company with it he names the *S'iva-sankalpa*. The beginning of the thirty-fourth chapter of the *Vája-saneyi-sankhitá* is still popularly known by that designation.

† Professor Rudolph Roth's *Zur Litteratur und Geschichte des Weda*, p. 31 ; and *Nirukta*, Erläuterungen, p. 58.

‡ I here extract a part of Govinda S'ástrí's commentary on the forty-fifth couplet of the *Atharvaṇa-rahasya* : काशीखण्डे लक्ष्मीस्तवे आथर्वणलक्ष्मीस्तु तमन्ववर्णा उपलब्धिताः अस्य

त्वं श्रीरुपेन्द्रसदने मदनैकमातरं

ज्योत्स्नाऽसि चन्द्रमसि चन्द्रमनोहरास्ये ।

सूर्ये प्रभा सितजगत्त्रितये प्रभासि

लक्ष्मी प्रसीद सततं नमतां शरण्ये ॥

त्वं जातवेदसि सदा दहनात्मशक्तिरु

वेधास्त्वया जगदिदं विविधं विदध्यात् ।

विश्वम्भरोऽपि बिभृयादखिलं भवत्या

लक्ष्मी प्रसीद सततं नमतां शरण्ये ॥

इत्यादिना शब्दसारूप्यादर्थाविरोधाच्च काशीखण्ड उपलब्धं द्रष्टव्यम् । नन्वथर्वसंहितायां श्रीसूक्तादर्शनाक्रीसूक्तमथर्वणो नास्तीति

The *S'ri-sūkta*, when seen in the *Rig-veda*, occurs, in my experience, invariably at the end of the fifth *mandala*. Though brief, it is by no means insignificant. Indeed, it has been selected for present notice on the ground of its marked pre-eminence among the

चेन्न । सप्तशतीव्याख्यादिषु श्रीसूक्तमाथर्वणप्रसिद्धमिति शिष्टोक्तेरु-  
च्छिन्नशाखासु तत्कल्पनस्यैवाचित्यात् । अत एव लक्ष्मीसूक्तनिरुक्ते ।

वैनतेय सोमं पिब सोमं पिबतु वृत्रहा ।

सोमं धनस्य सोमिनो मह्यं ददातु सोमिनः ॥

इति मन्त्रव्याख्याने । यतः सर्वे देवा धनरूपा उक्तास्तस्मात् तेनैव धनेन श्रौतस्मार्त्तकर्माद्यनुष्ठाना अभिभवन्ति । तदेवाऽभियज्ञगाथा गीयते । इत्युपक्रम्य वैनतेय विनतायाः पुत्र गरुत्मन्स्त्वमस्माभिः कृतं सोमं सोमरसं पिब पानं कुरु । वृत्रहेन्द्र सोमं पिबतु सोमपानं करोतु । सोमिनो यागकर्त्तारः सोमसम्बन्धिनो ऋत्विजः सोमं पिबन्तु सोमपानं कुर्वन्तु । सोमिनो यज्ञसम्बन्धिनो देवताश्च मह्यं यज्ञफलं धनाद्यभिष्टुष्टिं च ददातु दिशन्तु । इतोदं व्याख्यानमग्निसन्निधौ जप्त्वा सर्वान् कामानवाप्नोत्यनेनाऽग्निसन्निधौ तज्जपप्राशस्त्यं दर्शितम् । वैदिकभावे प्रयोजनमनुद्दिश्येति न्यायेन तज्जपफलप्रदर्शनस्योन्मत्तप्रलाप इवाऽप्रामाण्यापत्तेः । असूक्तविशेषस्तु मेरुतन्त्रे व्यक्त इत्यन्यत्र विस्तरः ।

A passage is given, first of all, professedly from the *Lakshmi-stava* of the *Kāśī-khanda*. It runs thus: 'Unrivalled mother of Madana, abiding in the mansion of Upendra, thou art S'ri. With countenance delightful to the mind as is the moon, to the moon thou art lustre, and radiance to the sun. Effulgent art thou throughout the bright triple world. Constantly be thou benignant, O Lakshmi, protectress, to thy adorers. Ever art thou the intrinsic combusive energy of fire. Vedhas, through thy agency, created this multiform universe Vis'wambhara also, by means of thee, has upheld it all. Constantly be thou benignant, O Lakshmi, protectress, to thy adorers.' This, urges Govinda, on the argument of verbal similarity and indiscrepancy of import, is paraphrased from the *S'ri-sūkta* of the *Atharvāna-veda*. Some nameless scholiast of the *Sapta-s'atī* is next alleged to have spoken of 'the *S'ri-sūkta*, notoriously A'tharvāna. From the *Lakshmi sūkta nirukta* a couplet is then adduced, with its explanation: and it should thus seem—as will be seen in the further progress of this paper—that not only the *S'ri-sūkta*, but its appendix as well, has enjoyed an exposition other than that which I now print. Govinda tells us, in fine, that somewhere else it is shown at length that the *S'ri-sūkta* is the theme of a detailed account in the *Meru-tantra*. All this is abundantly flaccid and unsatisfying.

compositions to which it belongs. In legal treatises its use is pre-

The first book of the *Vishṇu-purāṇa*, ninth chapter, has these words, in the narration of the churning of the ocean :

ततः स्फुरत्कान्तिमति विकासिकमले स्थिता ।

श्रीदेवी पयसस्तस्मादुत्थिता घृतपङ्कजा ॥ ६६ ॥

तां तुष्टुवुर्मुदा युक्ताः श्रीसूक्तेन महर्षयः ।

‘Subsequently, seated on an expanded lotus beaming with brilliancy, the goddess S’rī, bearing a lotus, emerged from that *sea of milk*. Joyfully did the great sages laud her with the *S’rī-sūkta*.’

According to the commentator, who repeats its commencement, that hymn was the very one with which we are concerned. No one can know more about the matter than he knew : and he can have known nothing.

Another melody addressed to S’rī, but claiming Indra for its author, will be found in the same chapter of the *Vishṇu-purāṇa* that has just been quoted from, beginning with the hundred and sixteenth stanza, and ending with the hundred and thirty-first.

Still another set of verses, eulogistic of Lakshmī, extending to only seven couplets, is cited, agreeably to one version, in the *Dāna-kamalākara* and elsewhere. Colebrooke has translated them in his *Miscellaneous Essays*, Vol. I., pp. 179 and 180. Here is the first of them :

या लक्ष्मीः सर्वदेवानां या च देवेष्ववस्थिता ।

धेनुरूपेण सा देवी मम शान्तिं प्रयच्छतु ॥

But of much more customary occurrence than any of the before mentioned poems is the *Lakshmī-hṛidaya-stotra*, in one hundred and six stanzas. It purports, in its colophon, to be derived from the *Uttara-kāṇḍa* of the *Atharva-rahasya*, whatever that work may be. The introductory lines are subjoined :

वन्दे लक्ष्मीं परशिवमयीं शुद्धजाम्बूनदाभां

तेजोरूपां कनकवसनां सर्वभूषोज्ज्वलाङ्गीं ।

बीजापूरं कनककलशं हेमपद्मं दधानां

आद्याशक्तिं सकलजननीं विश्रुवामाङ्गसंस्थाम् ॥

‘To Lakshmī—identical with supreme prosperity; lustrous as pure gold; splendour incorporate; of apparel like gold; whose person glitters with all manner of embellishments; bearing a citron, a golden vase, and an aureate lotus; the primæval energy; the universal genitrix; reposing on the left thigh of Vishṇu—I make obeisance.’

scribed for more than one important solemn ceremony,\* and, especially, at regal inaugurations. As a Vaidika *khila*, it likewise stands by itself, I believe, in having induced a commentary.

Neglecting inferior readings, as hardly meriting specification, I have collated five manuscripts of the scholia now published. The oldest of them which bears a date was transcribed only sixty-five years ago. In one of my copies, they are attributed to one Vidyādhara; another names Vidyā Tīrtha Mahes'wara as their author; a third assigns them, somewhat incredibly, to Vidyāranya Swāmin; and the rest are silent.

In the absence of smaller types provided with the accents, the exhibition of these marks has been dispensed with in the text of the ensuing hymn. Nor has it seemed necessary, as for the translation, to state at full all the optional interpretations suggested in the gloss.

## श्रीसूक्तम् ।

हिरण्यवर्णां हरिणीं सुवर्णरजतखजाम् ।

चन्द्रां हिरण्ययीं लक्ष्मीं जातवेदे म आ वह ॥ १ ॥

अस्याऽर्थः । हे जातवेदः जानाति वेदं । जातप्रज्ञो वा । जाते जाते विद्यत इति वा । हे अग्ने त्वं हिरण्यवर्णां हिरण्यस्य सुवर्णस्य वर्णः कान्तिलब्धद् वर्णो यस्यास्ताम् । हरिणीं हरितवर्णाम् । हरिणीरूपधरां वा ।

श्रीधृत्वा हरिणीरूपमरण्ये सञ्चचार ह ।

इति देवीपुराणाच्च । सुवर्णरजतखजां सुवर्णस्य रजतस्य च पुष्पाणि सुवर्णाणि रजतानि तेषां खक् माला यस्यास्ताम् । खक्साहचर्यात् पुष्पाणीत्यवगम्यते । पुष्पसादृश्यात् पुष्पे फले लुक् । आपं चैव हलन्तानामित्याप् । यदा सुवर्णरजतविकृतशृङ्खलाम् । सद्यु वर्णा यस्य तत् सुवर्णं यद् रजतं तत्पुष्पखजाम् । तद्विकृतशृङ्खलां वा । चन्द्रां चन्द्रवत् प्रकाशमानाम् । तद्रूपेणाऽवस्थितां वा । हिरण्ययीं

\* Noticeably during the *S'ārādī-nava-rātra*, or nine nights in the light fortnight of Āswina, one of the leading Hindu festivals. It is indispensable to read the *Srī-sūkta* at that season. The *Lakṣmī-hṛīdaya-stotra* and *Sapta-s'atī* are also largely perused at the same time.

हिरण्यस्वरूपाम् । हिरण्यविग्रहां वा । लक्ष्मीं लक्ष्मणवतीम् । लक्ष्मी-  
र्लाभाद् वा लक्ष्मणाद् वेद्यादिनिरुक्तात् । [नैगमकाण्डे ४. १०.] एवं-  
रूपां श्रियं मे मच्छां मदर्थमावहाऽऽकृय । अग्नेर्देवहोतृत्वादाङ्गानं  
तदधीनमिति भावः । अग्निर्वै देवानां होतृति श्रुतेः ॥ १ ॥

तां म आ वह जातवेदो लक्ष्मीमनपगामिनीम् ।

यस्यां हिरण्यं विन्देयं गामश्वं पुरुषानहम् ॥ २ ॥

अस्याऽर्थः । हे जातवेदः अग्ने त्वमनपगामिनीमपगमनरहितामन-  
पायिनीमित्यर्थः । तां वक्ष्यमाणलक्ष्मां लक्ष्मीं मे मच्छमावहाऽऽकृय ।  
यस्यां श्रीदेव्यामावाहितायां सत्यां हिरण्यं सुवर्णं गां धेनुमश्वं वाजिनं  
पुरुषान् पुत्रपौत्रमित्रदासभृतानहं विन्देयं प्राप्नुयाम् ॥ २ ॥

अश्वपूर्वां रथमध्यां हस्तिनादप्रबोधिनीम् ।

श्रियं देवीमुपकृये श्रीर्मा देवी जुषताम् ॥ ३ ॥

अस्याऽर्थः । अश्वपूर्वामश्वाः पूर्वं पुरोगा यस्यास्ताम् । अथवाऽश्व-  
पूर्वामश्वैः पूर्णां परिपूर्णामिति केचित् । रथमध्यां रथा मध्ये यस्या-  
स्ताम् । हस्तिनादप्रबोधिनीं हस्तिनां गजानां नादेन हंहितेन प्रबो-  
धिनीं प्रकर्षेण ज्ञापयित्रीम् । देवीं देवनशीलाम् । द्योतनशीलां वा ।  
श्रियं श्रयणीयाम् । सेनारूपां वा । उपकृये समीपं प्रत्याकृये । एता-  
दृशी देवी श्रीः मा मां जुषतां सेवताम् ॥ ३ ॥

कां सोस्मितां हिरण्यप्राकारामार्द्रां ज्वलन्तीं तप्तां तर्पयन्तीम् ।

पद्मे स्थितां पद्मवर्णां तामिहोपकृये श्रियम् ॥ ४ ॥

अस्याऽर्थः । कां बाहुमनसयोरगोचरां दुर्निरूपस्वरूपामित्यर्थः ।  
ब्रह्मरूपां वा । को ह वै नाम प्रजापतिरिति श्रुत्यन्तरात् । क इति  
ब्रह्मणो नामेति पुराणाच्च । सोस्मितां आ ईषदासमन्तादुद्धृतं  
यत् स्मितं द्वास्यं तद्युक्ताम् । उपान्त्यलोपश्चान्दसः । हिरण्यप्राकारां  
हिरण्यस्य सुवर्णस्य प्राकार आवरणं यस्यास्ताम् । हिरण्यपक्वष्ट आ-  
कारः आकृतिर्यस्यास्तामिति वा । मार्द्रां स्निग्धां क्षीरोदधेरुत्पन्नत्वात् ।  
रुद्ररूपां वा । रुद्रशब्देऽत्राऽमूर्धन्यस्वरादिः । मार्द्रया रुद्र इत्यादौ  
तथा दर्शनात् । अन्यद् बाहुलकम् । ज्वलन्तीं प्रकाशमानाम् । तप्तां  
प्रीतामपि च तर्पयन्तीं भक्तान् मनोरथैरिति शेषः । पद्मे स्थितां  
कमले निघण्टामासीनाम् । पद्मवर्णां कमलवर्णाम् । तामिति प्रसिद्धां  
श्रियमिहोपकृये समीपं प्रत्याकृये ॥ ४ ॥



चन्द्रां प्रभासां यशसा ज्वलन्तीं श्रियं लोके देवजुष्टामुदाराम् ।

तां पद्मिनीमीं शरणं प्रपद्येऽलक्ष्मीं नश्यतां त्वां वृणोमि ॥ ५ ॥

अस्यार्थः । अत्र प्रपद्ये इत्यस्याऽनन्तरमहंशब्दप्रक्षेपः प्रामादिकः ।

चन्द्रां चन्द्रवत् प्रकाशमानाम् । प्रभासां प्रकृष्टा भाः कान्तिर्यस्या-

स्ताम् । आपं चैवेत्याप् । यशसा कीर्त्या ज्वलन्तीं प्रकाशमानाम् ।

लोके स्वर्लोके देवजुष्टां देवैरिन्द्राद्यैर्जुष्टां सेविताम् । प्रीतां वा ।

उदारां वदान्याम् प्रगल्भां वा । पद्मिनीं पद्मलतारूपाम् । पद्माकारां

वा । ईमिति निपातोऽनर्थकः । मिताक्षरेष्वनर्थकाः कमीमिद्विति

यास्कवचनात् । [नैगमकाण्डे १०. ६.] ईकारवाच्यां वा । तां श्रियं

लोके इह लोके शरणं रक्षित्रीं प्रपद्ये प्रपन्नोऽस्मि । अहमिति शेषः ।

अतः हे श्रीः मे ममाऽलक्ष्मीः अश्रीः नश्यतां नाशं प्राप्नोतु । एतादृशीं

त्वां वृणोमि । अन्तर्भावितव्यार्थात् वृणे शरणत्वेन स्वीकुर्वे ॥ ५ ॥ वर्गः १ ।

आदित्यवर्णे तपसोऽधि जातो वनस्पतिस्तव वृक्षोऽथ बिल्वः ।

तस्य फलानि तपसा नुदन्तु मा या अन्तरा याश्च बाह्या अलक्ष्मीः ॥ ६ ॥

वृक्षोऽथेत्यतः परमपि पूर्वरूपं बाह्यलकात् । आदित्यवर्णे आदि-

त्यस्य सूर्यस्य वर्ण इव वर्णो यस्यास्तस्याः सम्बोधनं हे ओस्तव तपसः

नियमाद् हेतोः वनस्पतिः ।

अपुष्याः फलवन्तो ये ते वनस्पतयः स्मृताः ।

इति मानवस्मरणात् [१. ४७.] । बिल्वः बिल्वनामको वृक्षः द्रुमे-

ऽधिजातः प्रादुर्भूतः । तत्करादिति शेषः । कात्यायनः ।

बिल्वो लक्ष्म्याः करेऽभवत् ।

इति वामनपुराणात् । अथेत्यनन्तरं तस्य बिल्वस्य फलानि पक्वानि

शलाटुकानि तपसा त्वत्तपसा त्वदनुग्रहेणेत्यर्थः । अन्तरा अन्तरि-

न्द्रियसम्बन्धिन्यो याश्च बाह्या बहिरिन्द्रियसम्बन्धिन्यस्ता अलक्ष्मीर-

श्रियो नुदन्तु अपनुदन्तु निवारयन्त्वित्यर्थः ॥ ६ ॥

उपैतु मां देवसखः कीर्तिश्च मणिना सह ।

प्रादुर्भूतोऽस्मि राज्येऽस्मिन् कीर्तिमृद्धिं ददातु मे ॥ ७ ॥

अस्यार्थः । हे श्रीः देवसखः देवो महादेवस्तस्य सखा कुबेरः ।

कीर्तिश्च कीर्त्यभिमानिनी दत्तकन्या देवता । कुबेरकोशशाला वा ।

सा च मणिना चिन्तामणिना मणिभद्रेण कोशाध्यक्षेण सह सार्ध-

मुपैतु उपगच्छतु । अहमस्मिन् राज्ये जनपदे प्रादुर्भूतोऽस्मि उत्पन्ना-

ऽस्मि । सङ्गत्य कीर्तिं यशः कोशं वा ऋद्धिं सर्ववस्तुसमृद्धिं मे मह्यं  
ददातु यच्छतु ॥ ७ ॥

क्षुत्पिपासामलां ज्येष्ठामलक्ष्मीं नाशयाम्यहम् ।

अभूतिमसमृद्धिं च सर्वां निर्णुद मे गृहात् ॥ ८ ॥

अस्यार्थः । क्षुत्पिपासामलामशनदृष्ट्यामलिनात्मिकाम् । ज्येष्ठां वृद्धां  
श्रीप्रागुत्पन्नमित्यर्थः । अलक्ष्मीमश्रियमहं नाशयामि नाशं प्रापयामि ।  
हे श्रीस्त्वमभूतिमसम्पत्तिं तथा सर्वामसमृद्धिमनभिवृद्धिं मे मम  
गृहात् गेहात् निर्णुद निवारय ॥ ८ ॥

गन्धद्वारां दुराधर्षां नित्यपुष्टां करीषिणीम् ।

ईश्वरीं सर्वभूतानां तामिहोपङ्गये श्रियम् ॥ ९ ॥

अस्यार्थः । गन्धो घ्राणग्राह्यो गुणः द्वारं लक्षणं यस्यास्ताम् ।  
दुराधर्षां केनाऽपि धर्षयितुमशक्याम् । नित्यपुष्टां नित्यं निरन्तरं  
सस्यादिभिः पुष्टां समृद्धाम् । करीषिणीं करीषः शुष्कगोमयादिस्त-  
द्वर्तो गवाश्वादिबज्रपशुसमृद्धामिति यावत् । सर्वभूतानां सर्वप्राणिना-  
मीश्वरीमधिक्षात्रीम् । आधारभूतां वा । तां भूरूपां श्रियमिह लोके  
उपङ्गये उपाङ्गये समीपं प्रत्याङ्गये ॥ ९ ॥

मनसः काममाकूतिं वाचः सत्यमशीमहि ।

पशूनां रूपमन्नस्य मयि श्रीः श्रयतां यशः ॥ १० ॥

अस्यार्थः । हे श्रीः मनसः कामं मनोऽभिलाषम् । आकूतिं सङ्कल्पं  
च । वाचः वागिन्द्रियस्य सत्यं याथार्थ्यम् । पशूनां गोमहिष्यादीनां  
रूपं क्षीरादि । अन्नस्याऽक्षीत्यन्नं तस्याऽदनीयस्य यवब्रीह्यादे रूपं  
भक्ष्यादिचतुर्विधं चाऽशीमहि लभेमहि । श्रीः सम्पत्तिः यशः कीर्तिश्च  
मयि श्रयतामाश्रयताम् ॥ १० ॥ वर्गः २ ॥

कर्दमेन प्रजा भूता मयि सम्भव कर्दम ।

श्रियं वासय मे कुले मातरं पद्ममालिनीम् ॥ ११ ॥

अस्यार्थः । कर्दमेन कर्दमाख्येन पुत्रेण प्रकृष्टा जा अपत्यं यस्याः  
सा सुपुत्रेत्यर्थः । जामपत्यमिति यास्कवचनात् । [नैगमकाण्डे ३. ६.]  
भूता अभवत् । अतः हे कर्दम श्रीपुत्र त्वं मयि मदीयगृहे सम्भव  
संवस । पद्ममालिनीं कमलमालाधारिणीं मातरं तव जननीं श्रियं  
मे मम कुले वंशे वासय निवासय ॥ ११ ॥

आपः सृजन्तु स्निग्धानि चिक्षीत वस मे गृहे ।  
नि च देवीं मातरं श्रियं वासय मे कुले ॥ १२ ॥

अस्याऽर्थः । आपः जलाभिमान्यो देवताः । स्निग्धानि स्नेहयुक्तानि कार्याणि सृजन्तु उतादयन्तु । अपां स्नेहगुणवत्त्वादिति भावः । हे चिक्षीत चिक्षीताख्य श्रीपुत्र मे मम गृहे गेहे वस निवस । चाऽपि च देवीं मातरं श्रियं मे मम कुले वंशे निवासय संवासय ॥ १२ ॥

आर्द्रां पुष्करिणीं पुष्टिं पिङ्गलां पद्ममालिनीम् ।  
चन्द्रां हिरण्मयीं लक्ष्मीं जातवेदो म आ वह ॥ १३ ॥

अस्याऽर्थः । आर्द्रां आर्द्राङ्गाम् । पुष्करिणीं अभिषेकोद्युक्तां दिग्गज-  
शुण्डयेति भावः । पुष्करशब्दे गजशुण्डायवाचकः । पद्ममालिनीं  
पद्मवतीम् । पद्मलतारूपां वा । पुष्टिं पुष्ट्यभिमानिनीम् । पुष्टिरूपां  
वा । पुष्टिरूपेण संस्थितेति मार्कण्डेयवचनात् । पिङ्गलां पिङ्गलवर्णाम् ।  
पद्ममालिनीमित्यादि सिद्धमन्यत् ॥ १३ ॥

आर्द्रां यःकरिणीं यष्टिं सुवर्णां हेममालिनीम् ।  
सूर्यां हिरण्मयीं लक्ष्मीं जातवेदो स आ वह ॥ १४ ॥

अस्याऽर्थः । आर्द्रां आर्द्राङ्गाम् । यः करिणीं यष्टिकरां वेत्रहस्ता-  
मित्यर्थः । टिलोपश्वान्दसः । तद्वतीं दण्डकारिणीं वा । दण्डकरां वा ।  
यष्टिं दण्डरूपाम् । सुवर्णां शोभनवर्णाम् । हेममालिनीं हेमविकृत-  
मणिप्रदङ्गुलादिमालावतीम् । सूर्यां सूर्यवत् प्रकाशमानाम् । तद्रूपां  
वा । सिद्धमन्यत् ॥ १४ ॥

तां म आ वह जातवेदो लक्ष्मीमनपगामिनीम् ।

यस्यां हिरण्यं प्रभूतं गावो दास्योऽश्वान् निन्देयं पुरुषानहम् ॥ १५ ॥

अस्याऽर्थः । प्रभूतं भूयिष्ठम् । गावः गाः । दास्यः परिचारिकाः ।  
उभयत्र शस् । इयम्क् द्वितीयया ऋचा व्याख्याता । अर्थे इयान्  
विशेषः ॥ १५ ॥ वर्गः ३ ॥

इति श्रीसूक्तभाष्यं समाप्तम् ।

## TRANSLATION.

First *varga*.

1. Do thou, Játavedas,\* on my behalf invoke Lakshmí : radiant as gold, *and as fulvous* ; necklaced with gold and silver *flowers* ; a moon *in glory* ; of the nature of gold.

2. Do thou, Játavedas, on my behalf invoke that Lakshmí : who passes not away ; who *being present*, I shall possess gold, milch cattle, horses, and human beings.†

3. I invoke the goddess S'rí *to draw* near : with steeds in her van, and cars in the midst, especially announcing herself in the cry of elephants.‡ May the divine S'rí be propitious to me.

4. I invoke that S'rí *to draw* near : transcending expression and conception ;§ gently smiling ; environed with gold ; moist ; effulgent ; satisfied ; the satisfier ; sitting on á lotos ; lotos-hued.

5. I betake myself,|| for refuge, to that S'rí : as it were, a most brilliant moon ; splendid with celebrity ; honoured, by the gods, in the world *above* ; bountiful ; a lotos *in loveliness*. Thee do I solicit, that my evil fortune may be removed.

Second *varga*.

6. Resplendent as the sun, by reason of thy austerities the cryptogamous *bilwa*¶ tree was generated. Through thy favour may its fruit henceforth preclude, for me, misfortunes within and without.

\* He is identified with Agni, or Fire. Etymologically, the word is variously accounted for. Even our scholiast gives three explanations of it.

† Namely, children, grandchildren, friends, and thralls, says the commentator.

‡ In this stanza, Lakshmí is regarded as an army moving to victory. Further ; as elephants are found only with the wealthy, their presence betokens her.

The scholiast notes the lection अश्वपूर्णा, 'profuse of horses,' for अश्वपूर्वम् । Many manuscripts of the pure text have, in place of प्रबोधिनीं, प्रमोदिनीं, 'gladdened.'

§ This epithet, it is asserted, is denoted by the pregnant monosyllable क । Just below, S'rí is styled moist, as having been churned from the milky ocean. Hence one of her titles is अम्बिपुत्री 'daughter of the sea.'

|| Several of my copies of the mere text interpose अहं after शरणं an addition which the commentator censures.

¶ The aegle marmelos. According to the *Vámana purána*, Lakshmí bore it in her hand.

7. May the friend of the gods,\* and Renown, with the gem, be secured to me. In this realm I was brought forth. Do thou bestow upon me fame and a prosperous estate.

8. Calamity, squalid with hunger and thirst, the elder *sister of fortune*,† would I repel. Turn thou away from my dwelling all poverty and want of increase.

9. I invoke that *Srī to draw near*: characterised by odour; hard to be conquered; ever teeming *with harvests*; resident in cowdung; mistress over all creatures.‡

10. May I obtain the wish of *my heart*, *the object of my vow*, veracity of speech, the products of cattle, and *the various descriptions of edibles*.§ May prosperity abide in my *habitation*, and renowned.

\* Kubera, says the expositor. He is attributively called, to be sure *व्यम्बकसख* 'the friend of Trymbaka' or *S'iva*: but it is exceedingly questionable whether any very ancient authority designates this divinity by the simple word *देव*, or indeed, takes any note of him whatever. *Kīrti*, or Renown, was daughter of *Daksha*. The gem spoken of is said to be the famous 'jewel of reflection,' the Hindu cap of *Fortunatus*. Or *Manibhadra* may be meant; *Kubera's* treasurer.

A modern air, it is obvious to observe, infects the whole of this stanza; and the same remark is applicable to that which follows.

† This relationship I find predicated in the *Kārtika mātmya*, a section of the *Sanatkumāra saṅhitā*.

‡ The goddess is here viewed as one with the earth. It is still a notion everywhere current among the Hindus, that *Lakshmī* delights to lurk in cowdung.

§ By the products of cattle the several modifications of milk are signified. Esculents are classed as those to be licked, those to be drunk, those to be sucked, and those to be masticated.

This couplet, slightly altered, occurs in the *Yajur-veda*, *Vājasaneyi-saṅhitā*, XXXIX., 4; p. 973 of the edition of Professor Weber:

मनसः काममाकूतिं वाचः सत्यमशीय ।

पशूनां रूपमन्नस्य रसो यज्ञः श्रीः अयतां मयि स्वाहा ॥

*Mahidhara* explains this to the following effect: 'May I obtain the desire of *my heart*, *the fruit of my toil*, and truthfulness of utterance. May the ornament of cattle, the savour of aliment, fame, and fortune, continue in my *abode*. Be this oblation effectual.'

Third *varga*.

11. Excellent progeny has been born *to thee*, in Kardama.\* Do thou, Kardama, inhabit, with *me* my *abode*; and cause that *Srī* thy mother, lotos-garlanded, shall dwell with my family.

12. May water† perform *its* humid *offices*. Tarry in my domicile, Chiklita; and make that *Srī*, *thy* divine mother, shall remain in my household.

13. Do thou, Játavedas, on my behalf invoke Lakshmí: moist; accompanied by lotoses: thrift *personified*; yellow; lotos-garlanded; a moon *in glory*; of the nature of gold.‡

14. Do thou, Játavedas, on my behalf invoke Lakshmí: moist; verge in hand; a mace *to wrong-doers*; of comely complexion; wearing a golden necklace; a sun *in glory*; of the nature of gold.

15. Do thou, Játavedas, on my behalf invoke that Lakshmí: imperishable, who *being attendant*, I shall acquire gold in exuberance, kine, bondwomen, horses, and human beings.§

Manuscripts of the uncommented text of the *Srī sūkta* usually give, in sequence to the hymn, more or fewer of the couplets which here follow. The preference has purposely been accorded to the most copious form of the adjunct thus constituted.||

\* Of Kardama and Chiklita, as sons of Lakshmí, I have seen no other mention than in couplets contained in this paper.

† By metonymy, for the regents of water. So says the glossarist.

‡ The expositor proposes a second, but far-fetched, interpretation of the term which I render ‘accompanied by lotoses.’

Yellow is not the ordinary acceptation of पिङ्गल | Perhaps ‘tawny’ is here, as elsewhere, the precise equivalent. Colebrooke, in one place, represents it by “tan-coloured.” Algebra, &c., from the Sanskrit, p. 228. Lakshmí is something of a chameleon, as will be perceived in the course of this article.

The second half of the thirteenth stanza is a literal repetition from the first. With the change of a single word, it is found again in the fourteenth. In several of my manuscripts of the text, the thirteenth and fourteenth stanzas are transposed and confused.

§ This couplet simply contains two words more than the second, and does not differ from it, except in them, as to tenor.

|| Since preparing these pages for the press, I have received, from my very learned friend, Dr. Max Müller, a copy of the third volume of his *Rig-veda-sanhita* and Sáyana’s commentary. In his Varietas Lectionis I see that the *Srī-sūkta* is exhibited at large, together with the verses above referred to. My most extended reading of them turns out to be fuller than his by only half a stanza.

यः शुचिः प्रयतो भूत्वा जुहुयादाज्यमन्वहम् ।  
 सूक्तं पञ्चदशर्चं च श्रीकामः सततं जपेत् ॥ १ ॥  
 पद्मानने पद्मऊरु पद्माक्षी पद्मसम्भवे ।  
 तन् मे भजसि पद्माक्षि येन सौख्यं लभाम्यहम् ॥ २ ॥  
 अश्वदायी गोदायी धनदायी महाधने ।  
 धनं मे लभतां देवि सर्वकामांश्च देहि मे ॥ ३ ॥  
 पुत्रपौत्रधनं धान्यं हस्त्यश्वादि गवे रथम् ।  
 प्रजानां भवसी माता आयुष्मन्तं करोतु मे ॥ ४ ॥  
 धनमग्निर्धनं वायुर्धनं सूर्यो धनं वसुः ।  
 धनमिन्द्रो बृहस्पतिर्वरुणं धनमश्रुते ॥ ५ ॥  
 वैनतेय सोमं पिब सोमं पिबतु बृत्रहा ।  
 सोमं धनस्य सोमिनो मह्यं ददातु सोमिनः ॥ ६ ॥  
 न क्रोधो न च मात्सर्यं न लोभो नाऽशुभा मतिः ।  
 भवन्ति कृतपुण्यानां भक्तानां श्रीसूक्तं जपेत् ॥ ७ ॥  
 सरसिजनिलये सरोजहस्ते  
 धवलतरा शुभगन्धमाल्यशोभे ।  
 भगवति हरिवक्त्रभे मनोज्ञे  
 त्रिभुवनभूतिकरि प्रसीद मह्यम् ॥ ८ ॥  
 विष्णुपत्नीं क्षमां देवीं माधवीं माधवप्रियाम् ।  
 लक्ष्मीं प्रियसखीं देवीं नमाम्यच्युतवक्त्रभाम् ॥ ९ ॥  
 महालक्ष्मीं च विद्महे विष्णुपत्नीं च धीमहि ।  
 तन् नो लक्ष्मीः प्रचोदयात् ॥ १० ॥  
 पद्मासने पद्मिनि पद्मपत्रे  
 पद्मालये पद्मदलायताक्षि ।  
 विश्वप्रिये विश्वमनोऽनुकूले  
 त्वत्पादपद्मं हृदि सन्निधत्सु ॥ ११ ॥  
 आनन्दं कर्दम ओदक्षिणीत इति विश्रुताः ।  
 ऋषयः श्रियपुत्राश्च श्रीर्देवीर्देवता ॥ १२ ॥  
 श्रीवर्चस्वमायुष्यमारोग्यमाविधाच्  
 शुभमानं महीयते ।  
 धनं धान्यं पशुं बज्रपुत्रलाभं

शतसंवत्सरं दीर्घमायुः ॥ १३ ॥

ऋणरोगादिदारिद्र्यं पापक्षुद्रपम्विवः ।

भयशोकमनस्तापा नश्यन्तु मम सर्वदा ॥ १४ ॥

#### TRANSLATION.

1. Let that pure person who diligently sacrifices, day by day, with clarified butter, constantly ruminate, *if* desirous of fortune, the hymn of fifteen stanzas.

2. Lotos-thighed and lotos-eyed *art thou*. Lotos-faced, lotos born, lotos-eyed, in such wise befriend me, that I may obtain felicity.

3. Giver *art thou* of horses, giver of kine, and giver of wealth. Most opulent, may riches accrue to me : and do thou, goddess, bestow upon me all *my* desires.

4. Grant unto me sons, grandsons, affluence, corn, elephants, horses, kine, and chariots, *and to be* long-lived : *for* thou art the mother of sentient creation.

5. The fire possesses wealth ; the wind, wealth ; the sun, wealth ; the Vasus, wealth ; Indra, wealth ; and Brihaspati and Varuna, wealth.

6. Son of Vinatá, quaff the moon-plant juice. May Vṛitrahan imbibe the moon-plant juice. *May* the ministrant priests, *procurers* of riches, *partake of* the moon-plant juice. May the gods confer upon me *the requital of sacrifice*.\*

7. Be the litany to Fortune meditated : *for* of meritorious votaries there is no resentment, nor malevolence, no avarice, no sinister sentiment.

8. Lotos-tenemented, lotos-handed, supereminently fair, beautiful with white fragrance and *white* blossoms, adorable, beloved of Hari, lovely, source of the vigour of the threefold universe, be gracious to me.

\* This couplet has before been alluded to, in the foot-note to p. 123. The gloss there taken from the *Lakṣmī-sūkta-nirukta* has helped me to one or two suggestions.



9. To the spouse of Vishnu, *one with* the earth, the resplendent, Mádhaví, the cherished of Mádhava, the kind to her attendants, the dear to Achyuta, the goddess Lakshmi, I offer salutation.

10. We recognise the great Lakshmi; and we reflect on the consort of Vishnu. Therefore may Lakshmi speed us.

11. Lotos-seated, resembling the leaf of the lotos, dwelling in the lotos, of eyes long as the petal of the lotos, Padminí, loved of all, propitious to the wishes of the world, place thy lotos-foot in *my* heart.

12. The renowned A'nanda, Kardama, S'rída, and Chiklíta, issue of S'rí,\* are the *Rishis of this ode*: the goddess S'rí is *its* divinity.

13. Of auspicious dignity, longeval, and exempt from sickness does she render *her worshipper*: and wealth, grain, cattle, the gain of numerous offspring, and life prolonged to a hundred years *does she provide to him*. With signal deference is he revered *who does her honour*.

14. Debt, penury, sin, hunger, sudden death, fear, sorrow, disquietude of mind: for my behoof may they be done away with for ever.

*Saugor, May 11th, 1858.*

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\* It has already been remarked that Kardawa and Chiklíta are called sons of S'rí. A'nanda and S'rída here swell her progeny. S'rída, if identical with Kubera, has a different maternal descent assigned to him in the Pauránika theogonies. A'nanda, so far as I am aware, is altogether a stranger, except to the Jainas.

*On the Introduction of Writing into India.—By Professor*MAX. MULLER, *All Souls, Oxford.\**

Was the collection of the ten books of Vedic hymns the work of persons cognisant of the art of writing or not? Were the 1017 hymns of the Rig-veda, after they had been gathered into one body, preserved by memory or on paper? This is a question which, if it cannot be fully answered, requires at least to be carefully discussed.

We can hardly expect to find an answer to this question in the hymns themselves. Most persons acquainted with the history of popular poetry among the principal nations of antiquity would be ready to admit that the original composition and preservation of truly national poetry were everywhere due to the unaided efforts of memory. Nor is there one single allusion in these hymns to anything connected with writing. Where writing is known, it is almost impossible to compose a thousand hymns without bringing in some such words as, writing, reading, paper, or pen.

Let us consider the Old Testament.

The Ten Commandments were not only proclaimed by the voice of God, but Moses "went down from the mount, and the two tables of the testimony were in his hand: the tables were written on both their sides; on the one side and on the other were they written. And the tables were the work of God, and the writing was the writing of God, graven upon the tables." (Exodus xxxii. 15, 16.) Here we can have no doubt that the author of the Book of Exodus, and the people to whom it was addressed, were acquainted with the art of writing. Again we read (Exodus xxiv. 7), that "Moses took the book of the covenant, and read in the audience of the people;" and (Exodus xxv. 16.), the Lord commanded Moses, saying, "Thou shalt put into the ark the testi-

[\* This paper is an extract from a work now in the press on the history of ancient Sanskrit literature. Professor Müller has sent it for the Society's Journal in the hope of eliciting some fresh information from European or native scholars in India on the interesting questions which it discusses.—EDS.]

mony which I shall give thee." The covenant here spoken of must have existed as a book, or, at least, in some tangible form.

A nation so early acquainted with letters and books as the Jews, would naturally employ some of the terms connected with writing in a metaphorical sense. Thus we read in the Psalms (lvi. 8.) "Put thou my tears into thy bottle: are they not in thy book?"

lxix. 28. "Let them be blotted out of the book of the living, and not be written with the righteous."

xl. 7. "Then said I, Lo I come: in the volume of the book it is written of me."

xl. 1. "My tongue is the pen of a ready writer."

In the Book of Job (xix. 23), we actually read, "Oh that my words were now written! oh that they were printed in a book! That they were graven with an iron pen and lead in the rock for ever!" "Printed" here can only mean "written."

Proverbs iii. 3. "Write them upon the table of thine heart."

In the Homeric poems, on the contrary, where the whole Grecian life lies before us in marvellous completeness and distinctness, there is not a single mention of writing. The *λυγρὰ σημεῖα*, carried by Bellerophon instead of a letter, are the best proof that, even for such purposes, not to speak of literary compositions, the use of letters was unknown to the Homeric age. The art of writing, when it is not only applied to short inscriptions but to literature, forms such a complete revolution in the history of a nation, and in all the relations of society, both civil and political, that, in any class of ancient literature, the total absence of any allusion to writing may safely be supposed to prove the absence of the art at the time when that literature arose. We know the complete regeneration of modern Europe which was wrought by the invention of printing. Every page of the literature of the sixteenth century, every pamphlet or fly-sheet of the Reformation, tells us that printing had been invented. The discovery of writing, and more especially the application of writing to literary purposes, was a discovery infinitely more important than that of printing. And yet we are asked to believe that Homer should have hidden his light under a bushel, and erased every expression connected with writing from his dictionary!

But though it is certain that the Homeric poets did not write, or, if we are to adopt the legendary language of certain critics, though it is certain that blind Homer did not keep a private secretary, there is no doubt that, at the time of Pisistratus, when the final collection of the Homeric poems took place, that collection was a collection of written poems. Pisistratus possessed a large library, and, though books were not so common in his time as they were at the time of Alcibiades, when every schoolmaster had his Iliad, yet, ever since the importation of paper into Greece, writing was a common acquirement of the educated classes of Greeks. The whole civilisation of Greece, and the rapid growth of Greek literature, has been ascribed to the free trade between Egypt and Greece, beginning with the Saidic dynasty. Greece imported all its paper from Egypt; and without paper no Greek literature would have been possible. The skins of animals were too rare, and their preparation too expensive, to allow the growth of a popular literature. Herodotus mentions it as a peculiarity of the barbarians, that at his time some of them still wrote on skins only. Paper (papyrus or byblus) was evidently to Greece what linen paper was to Europe in the middle ages.\*

Now, if we look for any similar traces in the history of Indian literature, our search is completely disappointed. There is no mention of writing materials, whether paper, bark, or skins, at the time when the Indian Diaskeuasts collected the songs of their Rishis; nor is there any allusion to writing during the whole of the Brâhmana period. This upsets the common theories about the origin of prose literature. According to Wolf,† prose composition is a safe sign of a written literature. It is not so in India. The whole of the Brâhmana literature, however incredible it may seem, shows not a single vestige of the art of writing. Nay, more than this, even during the Sûtra period, all the evidence that we can get would lead us to suppose that even then, though the art of writing began to

\* Plin. Hist. Nat. xiii. 13. § 27.: "Cum chartæ usu maxime humanitas vitæ constat et memoria."

† Wolf, Prolegomena, lxx—lxxiii.: "Scripturam tentare et communi usui aptare plane idem videtur fuisse atque prosam tentare et in eâ excolendâ se ponere."

be known, the whole literature of India was preserved by oral tradition only.

It is of little avail in researches of this kind to say that such a thing is impossible. We can form no opinion of the powers of memory in a state of society so different from ours as the Indian Parishads are from our universities. Feats of memory, such as we hear of now and then, show that our notions of the limits of that faculty are quite arbitrary. Our own memory has been systematically undermined for many generations. To speak of nothing else, one sheet of the "Times" newspaper every morning is quite sufficient to distract and unsettle the healthiest memory. The remnants of our own debilitated memory cannot furnish us with the right measure of the primitive powers of that faculty. Even at the present day, when MSS. are neither scarce nor expensive, the young Brahmins who learn the songs of the Veda and the Brâhmanas, and the Sûtras, invariably learn them from oral tradition, and know them by heart. They spend year after year under the guidance of their teacher, learning a little day after day, repeating what they have learnt as part of their daily devotion, until at last they have mastered their subject, and are able to become teachers in turn. The ambition to master more than subject is hardly known in India. This system of education has been going on ever since the Brâhmana period, and as early as the Prâtisâkhyas we find the most minute rules on the mnemonic system to be followed by every teacher. The only difference in modern times, after the invention of writing, is that a Brahman is not only commanded to pass his apprenticeship at the house of his Guru, and to learn from his mouth all that a Brahman is bound to know, but the fiercest imprecations are uttered against all who would presume to acquire their knowledge from written sources. In the Mahâbbârata we read, "Those who sell the Vedas, and even those who write them, those also who defile them, they shall go to hell."\* Kumârila says "That knowledge of the truth is worthless which has been acquired from the Veda, if the

\* वेदविक्रयिन्सैव वेदानां चैव लेखकाः ।

वेदानां दूषकाश्चैव ते वै निरयगामिनः ॥

Veda has not been rightly comprehended, if it has been learnt from writing, or been received from a Sudra.”\*

How then was the Veda learnt? It was learnt by every Brahman during twelve years of his studentship or Brahmacharyâ. This, according to Gautama, was the shortest period, sanctioned only for men who wanted to get married, and to become Grihasthas. Brahmans who did not wish to marry were allowed to spend forty-eight years as students. The Prâtisâkhyâ gives us a glimpse into the lecture-rooms of the Brahmanic colleges. “The Guru,” it is said,† “who has himself formerly been a student, should make his pupils read. He himself takes his seat either to the east, or the north, or the north-east. If he has no more than one or two pupils, they sit at his right hand. If he has more, they place themselves according as there is room. They then embrace their master, and say, ‘Sir, read!’ The master gravely says ‘Om,’ *i. e.* ‘Yes.’ He then begins to say a pras’na (a question), which consists of three verses.‡ In order that no word may escape the attention of his pupils, he pronounces all with the high accent,§ and repeats certain words twice, or he says ‘so’ (iti) after these words.”

\* Kumârla, Tantra-Vârttika, i. 3. p. 86.

यथैवान्यायविज्ञाताद्देदाक्षेष्टादिपूर्वकात् ।

शूद्रेणाधिगताद्वापि धर्मज्ञानं न सम्मतं ॥

† Prâtisâkhyâ du Rig-veda, par A. Regnier, Journal Asiatique, 1856. Chapitre XV.

‡ If the metre is pankti, the pras’na may consist of two or three verses; if the metre is longer than pankti, two verses only constitute a pras’na; if a hymn consists of one verse, that by itself forms a pras’na. Samayas, *i. e.* passages which have occurred before (and are sometimes left out in the MSS), are counted, if they consist of a complete verse. Two Dvipadâs are counted as one verse, and, as the Commentator adds (v. 12.), the two half-verses of each Dvipadâ-line are to be joined in recitation, and only if there is one odd Dvipadâ-line remaining, a pause is to be made at the end of the first half-verse. If there are some verses remaining at the end of a hymn, they may be joined to the last pras’na; if there are more than two verses, this is optional.

§ The only words which, in the Sanhitâ-pâṭha, would be likely to escape the pupil’s attention are monosyllables consisting of one vowel only, and that a vowel not changed into a semi-vowel, in which form it would be more audible. This would restrict the rule regarding repetition to the two words *â* and *u*. Thus for *prâ*, which is *pra* + *â*, the Guru would have to say *prâ â* or *prâ â iti*. Instead

The chief difficulties in the pronunciation of the Veda are the changes of the final and initial letters.\* The pupils are instructed in these euphonic rules independently (the S'ikshâ), but whenever a difficult case of sandhi occurs, the Guru examines his audience and explains the difficulties. And here the method followed is this. After the Guru has pronounced a group of words, consisting of three or sometimes (in long compounds) of more words, the first pupil repeats the first word, and when anything is to be explained, the teacher stops him, and says, "Sir."† After it has been explained by the pupil who is at the head of the class, the permission to continue is given with the words, "Well, Sir." After the words of the teacher have thus been repeated by one, the next pupil has to apply to him with the word, "Sir."‡ When there is no difficulty the rule seems to be that the Guru says two words at a time, which are then repeated by the pupil. If it is a compound, one word only is to be pronounced by the Guru, and to be repeated by the pupil. After a section of three verses has thus been got through, all the pupils have to rehearse it again and again. When they have mastered it, they have to recite the whole without any break, with an even voice, observing all the rules of sandhi, marking slightly the division in the middle of compounds, and pronouncing every syllable with

of *ud u shya deva*, *ud u u shya deva*. This repetition would not take place in *udv eti*, because *u* is changed into *v*. If *sarvodâtta* could mean a word being wholly *udâtta*, then *u* would be excluded, and the rule would refer to *â* only. But *sarvodâtta* means recitation when the accent is disregarded, and all syllables are pronounced with a high tone. The Commentary construes the rule differently. I construe इह प्रवचने सर्वोदात्तत्वं । तस्मिन् सर्वोदात्तप्रयुक्त प्रवचनेऽतः तच्चाक्षेप्रयुक्तं द्विः प्रोक्तं अथवेतिकरणान् ॥

\* These are chiefly the change of a final *m* into *Anusvâra* before *r* and the *ûshmans*; the common sandhi of the *ûshmans*; the suppression of a final *n*; its transition into *r*; its transition into a sibilant; the absence of sandhi where *ri* follows; the sandhi of *r*, and the hiatus.

† The text is निर्वाचे तु &c.

‡ Here again I differ from the Commentator, who takes *parasya* as an adjective referring to *etad*, i. e. *guroh*. At the end of a half-verse, this address, *bho* ! is to be dropped; at the end of an *Adhyâya* it is optional.

the high accent.\* It does not seem as if several pupils were allowed to recite together, for it is stated distinctly that the Guru first tells the verses to his pupil on the right, and that every pupil after his task is finished, turns to the right, and walks round the tutor. This must occupy a long time every day, considering that a lecture consists of sixty and more *pras'nas*, or of about 180 verses. The pupils are not dismissed till the lecture is finished. At the end of the lecture, the tutor, after the last half-verse is finished, says, "Sir," the pupil replies, "Yes, Sir." He then repeats the proper verses and formulas, which have to be repeated at the end of every reading, embraces his tutor, and is allowed to withdraw.

These rules speak for themselves. They show that at the time when such rules were necessary, and when young Brahmins had to spend from twelve to forty-eight years of their life† in doing nothing but learning and rehearsing the Veda, such a system must have had an object worthy of such efforts. Such an object existed, if, in the absence of writing, the sacred songs, which were believed to be the only means to salvation were to be preserved and guarded against loss and corruption. If, at the time of the *Prâtis'ākhyas*, writing had been known, some mention of a book as a sacred object would surely have occurred somewhere. We know from the *Grihyasûtras* every event in the life of a Brahmin, from his birth to his death. Not a word is ever said about his learning to write.

The earliest allusion to this system of oral teaching occurs in a hymn of the *Rig-veda* which must be ascribed to the Mantra period. In the primitive poetry of the Chhandas period there is no mention either of writing or teaching. But in a satirical hymn of the *Vâsishthas* (vii. 103. 5.), in which the frogs are

\* According to some *S'ākhâs*, not the *S'ākhalas*, certain words (prepositions) are, in this final recitation also, to be followed by the particle *iti*; *abhi* is even, in some cases, to be pronounced *abhityabhi*. Some other rules are given, all of which are optional. The text of the Veda, as repeated in the lecture room, is neither *Sanhitâ*, *Pada*, nor *Krama*-text. Some few *Sākhâs* only maintain that the *Sanhitâ* text should be used *pure et simple*.

† Cæsar (*de Bello Gallico*, vi. 14.), speaking of the Druids, says: "Magnum ibi numerum versuum ediscere dicuntur, itaque nonnulli annos vicenos in disciplina permanent, neque fas esse existimant ea literis mandare."



compared with Brahmans, teaching their pupils, it is said : “ One frog repeats the words of another, like a pupil who repeats the words of his teacher.” No similar allusion to writing is to be found even in the latest hymns, the so-called Khilas. If writing had been known during the Brâhmana period, is it likely that these works, which are full of all kinds of mystic lucubrations on the origin of all things, should never with a single word have alluded to the art of writing, an art so wonderful that the Greeks would fain ascribe its discovery to one of the wisest gods of the wisest nation on earth ? If letters had been known during the period when men in India were still able to create gods, the god of letters would have found his place in the Vedic pantheon side by side with Sarasvatî, the goddess of speech, and Pûshan, the god of agriculture. No such god is to be found in India, or in any of the genuine mythologies of the Aryan world.

But there are stronger arguments than these to prove that, before the time of Pânini, and before the first spreading of Buddhism in India, writing for literary purposes was absolutely unknown.

If writing had been known to Pânini, some of his grammatical terms would surely point to the graphical appearance of words. I maintain that there is not a single word in Pânini's terminology which presupposes the existence of writing. The general name for letters is *varṇa*. This does not mean colour in the sense of a painted letter, but the colouring or modulation of the voice.\* *Akshara*, which is used for letter and syllable, means what is indestructible, radical, or an element. We speak of stops as signs of interpunction ; Pânini only speaks of *virāmas*, stoppages of the voice. The names of the letters are not derived from their shape, as in the Semitic names of Alpha, Beta, Gamma. With the exception of the *r* their names are their sounds. The name for *r*, *Repha*, does not occur in Pânini. Kâtâyâna, however (iii. 3, 108, 4.), explains the derivation of *Repha*, and in iv. 4, 128, 2, he uses it for *ra*. In the Prâtisâkhyas likewise, the word is well known, and as the participle *riphita* is used in the same works, there can be little doubt that *Repha* is derived from a root *riph*, to snarl or hiss.

\* Aristotle, Probl. x. 39. τὰ δὲ γράμματα πάθη ἐστὶ τῆς φωνῆς.

The terms for the three accents show no traces of writing, such as the Latin word "circumflexus."

What would have been more natural, if writing had been known in Pânini's time, than that he should have called the dot of the Anusvâra, *vindu*, i. e. dot, and the Visarga, *dvivindu*, the double dot? Let us take a later grammarian, Vopadeva, and we find such words at once. In Vopadeva, the Anusvâra is called *vindu*, the Visarga, *dvivindu*. What the Prâtisâkhyas and Pânini called the *Jihvâmûlîya*, the sibilant formed near the base of the tongue, and *Upadhmanîya*, the labial flatus, Vopadeva calls *Vajrâkrîti*, having the shape of the thunderbolt (×), and *Gajakumbhâkrîti*, having the shape of an elephant's two frontal bones (𑖦). The term *ardha-chandra*, or half-moon, belongs to the same class of grammatical terms. Why should these words occur in later grammarians, and not one of them be found in the Prâtisâkhyas or Pânini?

Another class of words which would be sure to betray the existence of writing where writing was known, are the words expressive of reading, composing, book, chapter, paragraph, &c. The most usual word for reading in Sanskrit is *adhyeti* or *adhîte* and at first sight the very existence of such a word might seem to prove the existence of books that could be read. But we have seen in the Prâtisâkhyas what was meant when the pupils asked their tutor to make them read. *Adhyeti* and *adhîte* from *adhi*, over, and *i*, to go, mean "he goes over a thing, he conquers it, acquires it;" and the very expression "to read a work from the mouth of the tutor," would be sufficient to show that the work existed, not as a book, but in men's memory. Another expression of the same kind is found in Manu (x. 1.): "All the three castes may read the Veda, but the Brahman alone is allowed to proclaim i. e. to teach it (*prabrûyat*)." To teach is expressed by the causative of the verb *adhyeti*, *adhyâpayati*, he makes read, i. e. he teaches. The ancient Hindus distinguish between two kinds of reading, the *grahanâdhyayana*, the acquisitive reading, and the *dhâranâdhyayana*, the conservative reading; the former being the first acquisition of a work, the latter its rehearsing in order not to lose a volume that once belonged to one's mental library. This rehearsing, or *svâdhyâya*, self-reading,

was as sacred a duty as the first acquisition. It was by means of this svādhyāya alone that works could be said to live. We meet with similar expressions in other literatures of the ancient world. Ahuramasdâ, when he wishes his law to live among men, requires Jima to be not only the “rememberer” (meretâ), but the bearer and preserver (bheretâ), of the Zarathustrian revelation. And many centuries later, Mahāvīra,\* the founder of the Jaina religion, is called *sāraē*, *vāraē*, and *dhāraē* of sacred knowledge, i. e. *smāraka*, a rememberer, *vāraka*, a guardian who keeps it from profane eyes, and *dhāraka*, a holder who does not forget the knowledge which he once acquired.

Even so late a writer as Kumârila, when he speaks of the material existence of the Veda, can only conceive of it as existing in the minds of men. “The Veda,” he says, “is distinctly to be perceived by means of the senses.† It exists, like a pot or any other object, in man. Perceiving it in another man, people learn it and remember it. Then others again perceiving it, as it is remembered by these, learn it and remember it, and thus hand it on to others. Therefore, the theologian concludes, the Veda is without a beginning.” These theological arguments may be passed over: but immediately afterwards, in order to show that the Veda has a material existence, Kumârila uses another curious expression, which shows again that to him the Veda existed only in the memory of men. “Before we hear the word Veda,” he says, “we perceive, as different from all other objects, and as different from other Vedas, something in the form of the Rig-veda that exists within the readers, and things in the form of Mantras and Brâhmanas, different from others.” Such

\* Kalpa Sutra, ed. Stevenson, p. 29.

† वेदः पुनः सविशेष प्रत्यक्षगम्यः। तत्र घटादिवदेव पुरुषान्तरस्थ-  
मुपलभ्य स्मरन्ति। तैरपि स्मृतमुपलभ्यान्वेऽपि स्मरन्तो न्येभ्यस्तथैव  
समर्थयन्तीत्यनादिता॥ सर्वस्य चात्मोयस्मरणात्पूर्वमुपलब्धिः सम्भव-  
तीति निर्मूलता॥ शब्दसम्बन्धव्युत्पत्तिमात्रमेव चेह दृढव्यवहारा-  
धीनं॥ प्रागपि हि वेदशब्दादन्यवस्तुविलक्षणं वेदान्तरविलक्षणं  
चाध्येतस्य ऋग्वेदादिरूपं मन्त्रब्राह्मणादिरूपाणि चान्यविलक्षणान्युप-  
लभ्यन्ते सर्वेषां चानादयः संज्ञाः॥

arguments would not occur to people who were accustomed from time immemorial to appeal to a book as the sacred authority of their faith. When contemporaneously with our Reformation, Nanak founded the religion of the Sikhs, we find in India, as well as elsewhere, that a book, a real book, was considered as the firmest foundation of a new faith. "At their assemblies, when the chiefs and principal leaders are seated, the *Adi-Granth* (the first book) and *Das'ama Pádsháhka Granth* are placed before them; they all bend their heads before these scriptures, and exclaim, *Wa! Gurujika Khálsa! Wa! Gurujiki Fateh!* A great quantity of cakes, made of wheat, butter, and sugar, are then placed before the volumes of their sacred writings, and covered with a cloth. These holy cakes, which are in commemoration of the injunction of Nanak, to eat and to give to others to eat, next receive the salutation of the assembly, who then rise, and the *Acalis* pray aloud, while the musicians play. The *Acalis*, when the prayers are finished, desire the council to be seated. They sit down, and the cakes being uncovered are eaten of by all classes of Sikhs; those distinctions of original tribes, which are on other occasions kept up, being on this occasion laid aside, in token of their general and complete union in one cause. The *Acalis* then exclaim, "*Sirdars! (chiefs) this is a Gurumatá*" (a great assembly); on which, prayers are again said aloud. The chiefs, after this, sit closer, and say to each other: "The sacred *Granth* (book) is betwixt us, let us swear by our scriptures to forget all external disputes, and to be united."\*

Such a scene would be impossible among pure Brahmins. They never speak of their *granthas* or books. They speak of their *Veda*, which means "knowledge." They speak of their *S'ruti*, which means what they have heard with their ears. They speak of *Smriti*, which means what their fathers have declared unto them. We meet with *Bráhmaṇas*, i. e. the sayings of Brahmins; with *Sútras*, i. e. the strings of rules; with *Vedāṅgas*, i. e. the members of the *Veda*; with *Pravachanas*, i. e. preachings; with *S'ástras*, i. e. teachings; with *Dars'anas*, i. e. demonstrations; but we never meet with a book, or a volume, or a page.

If we take the ordinary modern words for book, paper, ink,

\* Asiatic Researches, xi. 255.

writing, &c., not one of them has as yet been discovered in any Sanskrit work of genuine antiquity. Book, in modern Sanskrit, is *pustam* or *pustakam*, a word most likely of foreign origin.\* It occurs in such works as the *Hitopade'sa*, where we read of a person, "neither read in books nor taught by a tutor." The *Hitopades'a* itself is said to be written (*likhyate*) as an extract from the *Panchatantra* and another book.†

To write is *likh* and *lip*, the former originally used in the sense of scratching, whether on stone or leaves, the latter, in the sense of covering a surface with ink. Thus in *S'akuntala*, the chief heroine, when advised to write a love-letter (*madanalekha*), complains that she has no writing-materials (*lekhanasādhāni*), and her friend tells her to take a lotus-leaf as smooth as the breast of a parrot, and with her nails to scratch the letters on it. This is clearly writing. In the *Vikramorvasî* again, *Urvasî* not daring to face her lover, writes a letter (*lekha*) on a birch-leaf (*bhûrjapatra*). The king, who sees it, calls it *bhûrjagato aksharavinyāsa*, "letters put down on a birch-leaf;" and when he reads it, he is said to make the leaf speak (*vāchayati*). The leaf (*patra*) is used here not in the sense in which we found it in *S'akuntala*, as the leaf of a tree, but as a leaf or sheet of paper. This paper was made of the bark of the birch-tree; and hence, when the queen picks up the love-letter, she thinks "it is a strip of fresh bark which the south wind has blown thither."‡

Passages like these, to which we might add the well known introduction of the *Mahābhārata*, leave little doubt that, at the time when these modern plays were composed, writing was generally practised by women as well as men. Why should there be no such passage in any of the genuine early Sanskrit works, if writing had then been equally known?

\* Could it be *apestak*, originally the Sanskrit *avasthāna*? See Spiegel, *Grammar of the Parsi Language*, p. 204.

† पञ्चतन्त्राद्यन्यस्माद्ग्रन्थादावपि लिख्यते ॥

‡ There are, I believe, but two Sanskrit MSS. in Europe which are written on birch bark, one in the Royal Library of Berlin, the other in the Library of All Souls College, Oxford.

In Manu's Code of Laws we read (viii. 168): "What is given by force, what is by force enjoyed, by force caused *to be written* (*lekhta*), and all other things done by force, Manu has pronounced void." Here again we have clearly writing. But this is only another proof that this metrical paraphrase of the laws of the Mānavas is later than the Vedic age.

In the Laws of Yājñavalkya also written documents are mentioned, and the Commentator (ii. 22) quotes Nārada and other authorities, all in Slokas, on several minor points connected with the signing (*chihṇita*) of papers, and the treatment of witnesses who cannot write (*alipijna*). But I have found no such traces of written documents in any of the ancient Dharmasūtras.

The words for ink (*masi*,\* *kālī*, *mela*, *gola*) and pen (*kalama*), have† all a modern appearance, and as to *Kāyastha*, the name of writer caste, proceeding from a Kshatriya father and a Sudra mother, it does not even occur in Manu.

Another class of words which would be likely to contain allusions to writing are those used for the various subdivisions of literary compositions; but these too point to a literature kept up by oral tradition only. We observed before that a lecture (*adhyāya*) consisted of sixty questions or *praśnas*. We find these very words used instead of chapters and paragraphs in the Saṃhitās, Brāhmanas, and Sūtras. In the Rīg-veda we have the ancient division in *sūktas*, hymns; *anuvākas*, chapters (*i. e.* repetitions); and *mandalas*, books (*i. e.* cycles): and the later division in *vargas*, classes; *adhyāyas*, lectures; and *Aṣṭakas*, Ogdoads. In the Taittirīyaka, the division is into *Kaṇḍikās* (sections), *anuvākas*, *praśnas*, and *aṣṭakas*. In the Kāthaka we have *granthas*, compositions, and *sthānakas*, loci. The name of the *Satapathabhrāmana* is derived from its 100 *pathas* or walks; and *Shashtipatha* is used for a work consisting of sixty walks or chapters. Other words of the same kind are *prapāṭhaka*, a reading, a lecture; *āhnikā*, a day's work; *parva*, a joint, &c. We look in vain for such words as *volumen*, a volume, *liber*, *i. e.* the inner bark of a tree; or βίβλος, *i. e.* βύβλος, the inner bark of the papyrus; or *book*, *i. e.* beech-wood.

\* Lalita Vistara, adhyaya, ix. p. 139, l. 17.

† Unādi-sutras, iv. 84. calamus, reed.

It is clear from the evidence which we have examined, that it is far easier to prove the absence of writing during the early period of Sanskrit literature, than to discover any traces of writing even at the time when we are inclined to suppose that it was known in India. Writing was practised in India before the time of Alexander's conquest, and, though it may not have been used for literary purposes, we can hardly doubt that a written alphabet was known during the greater part of the Sûtra-period. The Greek writers tell us exactly what we should expect under these circumstances. Megasthenes declared that the Indians did not know letters, that their laws were not written, and that they administered justice from memory.\* This is perfectly true, if, as has been pointed out,† we restrict their ignorance of letters to the fact that they did not employ them for literary purposes. Strabo himself, when quoting the statement of Nearchus that the Indians wrote letters on cotton that had been well beaten together, points out the contradiction between this author and others (*i. e.* Megasthenes), who declared that the Indians used no letters at all.‡ There is, however, no real contradiction between these two statements, if we only distinguish between the knowledge of letters and their use as a vehicle of literature. Nearchus fully agrees with Megasthenes; for he also states that the laws of the Indians were not reduced to writing.§ And Megasthenes agrees with Nearchus; for he also shows himself perfectly acquainted with the fact that the Indians used letters for inscriptions on milestones, indicating the resting-places and distances.|| Nothing could offer a stronger confirmation of our opinion that the Indians had become acquainted with the art of writing during the Sûtra-period and before the conquest of Alex-

\* Strabo, xv. 53.: . . . . 'Αγράφους καὶ ταῦτα νόμοις χρωμένοις. Οὐδὲ γὰρ γράμματα εἰδέναι αὐτοὺς, ἀλλ' ἀπὸ μνήμης ἕκαστα διοικεῖσθαι.

† Schwanbeck, Megasthenis Fragmenta, p. 50.

‡ Strabo, xv. 67.: 'Επιστολὰς δὲ γράφειν ἐν σιδόσι λίαν κέκροτημέναις, τῶν ἄλλων γράμμασιν αὐτοὺς μὴ χρῆσθαι φαμένων.

§ Strabo, xv. 66.: Νέαρχος δὲ περὶ τῶν σοφιστῶν οὕτω λέγει· τοὺς μὲν νόμους ἀγράφους εἶναι.

|| Οἱ ἀγορανόμοι . . . ὁδοποιούσι, καὶ κατὰ δέκα στάδια στήλην τιθέασιν τὰς ἐκτροπὰς καὶ τὰ διαστήματα δηλούσας.

ander, but that they abstained from using it for literary purposes, than this apparent contradiction in the accounts of Nearchus and Megasthenes. Curtius, differing from Nearchus, maintains that they wrote on the soft rind of trees,\* a custom which we saw preserved in the play of *Urva'sî*. We could hardly believe that the Indians should have used skins for writing. And though Nicolaus Damascenus declares that he saw the ambassadors of Porus to Cæsar Augustus in Antiochia, and that they brought a letter written ἐν διφθέρα, we must remember that that letter was written in Greek,† and that the word διφθέρα might have been used for paper in general‡

We shall not be able to trace the Indian alphabet back much beyond Alexander's invasion. It existed, however, before Alexander. This we know from Nearchus himself, who ascribes to the Indians the art of making paper from cotton. Now, in looking for traces of writing before Alexander's time, we find in the *Lalita-vistara*, which contains the life of Buddha, that the young S'âkya is represented as learning to write. Though the *Lalita-vistara* cannot be regarded as a contemporaneous witness, it is nevertheless a canonical book of the Buddhists, and as such must be ascribed to the third council. It was translated into Chinese 76 A. D. As we have seen before the system of instruction practised in the lecture-rooms of the Brahmins, it will perhaps be of interest to glance at the schools in which Buddha was educated, or supposed to have been educated.

“When the young prince had grown, he was led to the writing-school (*lipi's'âlâ*).§” We may leave out all the wonderful things that happened on this occasion, how he received a hundred thousand blessings, how he was surrounded by ten thousand children, preceded by ten thousand chariots full of sweetmeats, of silver and gold; how the town of Kapilavastu was cleansed, how music sounded everywhere, and showers of flowers were thrown from the roofs,

\* Curtius, 8, 9. “*Libri arborum teneri, haud secus quam chartæ, literarum notas capiunt.*”

† Strabo, xv. 73. Τὴν δὲ ἐπιστολὴν ἑλληνίζειν ἐν διφθέρα γεγραμμένην.

‡ Herodotus, v. 58.

§ *Lalita-Vistara*, Adhyâya, x.



windows, and balconies ; how not satisfied with this, celestial ladies walked before him to clear the road, and the daughters of the wind scattered celestial flowers, besides other fabulous beings who all came to honour the Bodhisatva as he went to school. These marginal illustrations may be dropped in all Buddhist books, though they leave but little room for the text. When Buddha entered the school, Vis'vâmitra, the schoolmaster (Dârakâchârya), unable to bear the majesty of Bodhisatva's presence, fell to the ground, and had to be lifted up by an angel, named S'ubhânga. After the king S'uddhodana and his suite had left, the nurses and attendants sat down, and Bodhisatva took a leaf to write on (lipiphalaka) made of sandal-wood (uragasârachandana-mayam). He then asked Vis'vâmitra what writing he was going to teach him. Here follow sixty-four names, apparently names of alphabets,\* all of which Bodhisatva is acquainted with, whereas Vis'vâmitra is obliged to confess his ignorance. Nevertheless Bodhisatva stays at school, and learns to write together with ten thousand boys.

The alphabet which he learns is the common Sanskrit alphabet, with the omission of the letters l, ñ and ṛ. It consists of 45 letters, and, as in our own primers, every letter is followed by a word containing that letter at the beginning or in the middle. These words in the Lalita-vistara are so chosen as to illustrate some of the chief points of Buddha's own doctrines. The alphabet is :—a, â, i, î, u, û, e, ai, o, au, am, ah ; k, kh, g, gh, ñ ; ch, chh, j, jh, n ; t, th, d, dh, n ; p, ph, b, bh, m ; y, r, v ; s', sh, s, h, ksh.

Though the further education of Buddha is not fully described, we see him soon afterwards in general competition, the most distinguished scholar, arithmetician, musician and everything else.† This comprehensive system of education, through which Buddha is here represented to have passed, is the very opposite of that followed by

\* The most interesting names are Anga (Bhagalpur), Banga (Bengal), Magadha, Drâvida, Dakshina (Dekhan), Darada, Khâsya (Cassia hills), China (Chinese), Hûna, Deva (Devarâgari), Bhaumadeva (Brahman), Uttarakurus, anudruta (cursive).

† Among the subjects in which he shows his learning, figure Nirghaṇṭu, Nigama, Purâna, Itihâsa, Veda, Vyākaraṇa, Nirukta, Sikshâ, Chhandas, Kalpa, Tyotisha, Sâṅkhya, Yoga, Vais'eshika.

the Brahmans. We nowhere meet in the Buddhist literature with those strong imprecations against book-learning which we found among the Brahmans, and which may be heard, I believe, even at the present day.

If thus the first, though rather legendary, trace of writing, as a part of the elementary education in India, is\* discovered in the life of Buddha, it is curious to observe that the first actual writing, the first well authenticated inscription in India, is likewise of Buddhist origin. There are no Brahmanic inscriptions earlier than the Buddhist inscriptions of As'oka on the rocks of Kapurdigiri, Dhauli, and Girnar. They belong to the third century before Christ. They call themselves *lipi*, a writing,† or *dharmalipi*,‡ a sacred writing; and they mention the writer or engraver by the name of *lipikara*.§ This last word *lipikara* is an important word, for it is the only word in the Sûtras of Pânini which can be legitimately adduced to prove that Pânini was acquainted with the art of writing. He teaches the formation of this word, iii. 2, 21. There is indeed another passage, which has frequently been quoted, where Pânini teaches the formation of the adjective *yavanânî*. This is simply the feminine of *yavana*, as *Indrânî* is of *Indra*. Kâtyâyana, however, and the Commentator, both maintain that *yavanânî* is used as a name of *lipi*, and that it meant the writing of the Yavanas. I see no reason to doubt that the examples which we find in the Commentaries go back to the very time of Pânini, and I am quite willing to admit that Pânini gave his rule on *yavanânî* simply in order to explain *Yavanânî*, as the name of a certain alphabet. But I must demur to any further conclusions. *Yavana* is by no means the exclusive name of the Greeks or Ionians. Professor Lassen has proved that it had a much wider meaning, and that it was even

\* In an ancient inscription of Khandgiri (Journal of the Asiat. Soc. of Bengal, vi. 318), a king is mentioned who in his youth learned to write, and was taught besides, arithmetic, navigation, commerce, and law ("tato likharûpagana nâva vapâra vidhi vi'sâradena.")

† Etâya athâya iyaṃ lipi likhitâ; for this purpose was the writing written.

‡ Iyaṃ dhammalipî Devâṇaṃ piyena piyadasinâ rânâ likhâpitâ asti eva, p. 752.

§ Burnouf, Lotus, p. 752.

used of Semitic nations. There is nothing to prove that Pânini was later than Alexander, or that he was acquainted with Greek literature. In the *Lalita-vistara*, where all possible alphabets are mentioned, nothing is said of a *Yavanânî* or a Greek alphabet. The Sanskrit alphabet, though it has always been suspected to be derived from a Semitic source, has not certainly been traced back to a Greek source. It shows more similarity with the Aramæan than with any other variety of the Phœnician alphabet.\* *Yavanânî* lipi might mean that variety of the Semitic alphabet which, previous to Alexander, and previous to Pânini, became the type of the Indian alphabet. But all this is merely conjectural. It is impossible to arrive at any certain interpretation of *Yavanânî*, as used by Pânini; and it is much better to confess this, than to force the word into an argument for any preconceived notions as to the origin of the Indian alphabet.

There is another word in Pânini which might seem to prove that not only the art of writing, but written books were known at his time. This is *grantha*. *Grantha* occurs four times in our texts of Pânini.† In I. 3, 75, it is so used as to apply to the Veda. In IV. 3, 87, it may refer to any work. In IV. 3, 116, it is applied to the work of any individual author. In VI. 3, 79, it may refer to any work that is studied. I do not attribute much importance to the fact that I. 3, 75, and IV. 3, 116, are marked as not explained in the Commentaries; for I confess that in none of these four passages can I discover anything to prove that *grantha* must mean a written or a bound book. *Grantha* is derived from a root *grath*, which means *nectere*, *serere*. *Grantha*, therefore, like the later *sandarbhā*, would simply mean a composition.‡ It corresponds

\* Lepsius, *Zwei sprachvergleichende Abhandlungen*, p. 78., Schulze's conjecture about *Mesnud*. Weber, *Indische Skizzen*.

† I. 3. 73—77 na. vy.:

समुदाङ्म्यो यनो ऽग्रन्थे ॥ १. ३. ७५ ॥

अधिष्ठत्य कृते ग्रन्थे ॥ ४. ३. ८७ ॥

कृते ग्रन्थे ॥ ४. ३. ११६ ॥

ग्रन्थान्ताधिके च ॥ ६. ३. ७६ ॥

‡ Thus the Commentator to *Rig-veda*, I, 67, 4, explains *chritanti* by *agnim uddis'ya stutir grathnanti, kurvantītyarthah*.

etymologically with the Latin *textus*. Thus it is used by the Commentator to Nir. I. 20, where he says that former teachers handed down the hymns *granthato' rthatas'cha*, "according to their text and according to their meaning." In the later literature of India *grantha* was used for a volume, and in *granthakûti*, a library, we see clearly that it has that meaning. But in the early literature *grantha* does not mean *pustaka*, or a book ; it means simply a composition, as opposed to a traditional work.

This distinction between traditional works, and works composed by individual authors, is of frequent occurrence in Pāṇini. From IV. 3, 101. to 111. he gives rules how to derive the titles of works from the names of those by whom they were proclaimed (*tena proktam*). But in most cases these derivations are used by Pāṇini as intermediate links only, in order to form the names of Charaṇas who read and preserve these works. Never, he says (IV. 2, 66.), use the derivation, which would be the title of a work, in the case of hymns (*chhandas*) or Brāhmaṇas. Do not call a work proclaimed by Kaṭha, Kaṭham, but only speak of Kaṭhas, *i. e.* those who hand down the works proclaimed by Kaṭha. Another still more significant restriction is made by Pāṇini. With reference to modern works, he says you may use the neuter in the singular or plural, instead of the plural of the masculine. The Brāhmaṇas taught by Yājñavalkya may be spoken of as such. But the ancient Brāhmaṇas first proclaimed by Bhallava, &c., can only be spoken of as "the Bhāllavins" (*Bhallavidæ*), because it is only in the tradition of his descendants that the works of Bhallava and other ancient sages may be said to live.

However we examine the ancient Sanskrit phraseology with regard to books and their authors, we invariably arrive at the same results. In the most ancient literature, the idea even of authorship is excluded. Works are spoken of as revealed to and communicated by certain sages, but not as composed by them. In the later literature of the Brāhmaṇa and Sūtra period the idea of authorship is admitted, but no trace is to be found anywhere of any books being committed to writing. It is possible I may have overlooked some words in the Brāhmaṇas and Sūtras, which would prove the existence of written books, previous to Pāṇini. If so, it is not from any wish to suppress them. I do believe that the Brāhmaṇas were

preserved by oral tradition only, but I should feel inclined to claim an acquaintance with the art of writing for the authors of the Sûtras. And there is one word which seems to strengthen such a supposition. We find that several of the Sûtras are divided into chapters called *paṭalas*. This is a word never used for the subdivisions of the Brâhmaṇas. Its meaning is a covering, the surrounding skin or membrane; it is also used for a tree. If so, it would seem to be almost synonymous with *liber* and βίβλος and it would mean a *book*, after meaning originally a sheet of paper made of the surrounding bark of trees. If writing came in towards the latter half of the Sûtra period, it would no doubt be applied at the same time to reducing the hymns and Brâhmaṇas to a written form. Previous to that time, however, we are bound to admit that the collection of the hymns, and the immense mass of the Brâhmaṇa literature, were preserved by means of oral tradition only.

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PROCEEDINGS  
OF THE  
ASIATIC SOCIETY OF BENGAL,

FOR FEBRUARY, 1859.

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The Monthly General Meeting of the Asiatic Society was held on the 2nd instant.

The proceedings of the December and January meetings were read and confirmed.

Presentations were received.

1. From Lieut. E. H. Fergusson, Superintendent, Government Observatory, Bombay, a copy of the Magnetical and Meteorological Observations made at the Bombay Observatory in the year 1857.

2. From Captain Burbank, Steamer *Fire Queen*, an Andaman Canoe.

3. From Rt. Rev. P. Bigandet, Bishop and Vicar Apostolic of Ava and Pegu, a work on Buddhism in Burmah.

4. From Captain F. A. V. Thurburn, a small tin box containing 124 copper coins collected at Ajodheia, of which 5 or 6 may prove valuable, and which he begged to present to the Society.

5. From Dr. Macgowan of Ningpo corresponding member of the Society, some Chinese iron coins.

6. From Mr. Jennings of Messrs. Osler and Co. through Major Thuillier, a map of China and part of Hindostan, published in the 16th century. (Sent for exhibition.)

7. From His Highness the Maha Rajah of Burdwan, a ball found in the small intestines of a Giraffe which died suddenly.

8. From E. A. Samuells, Esq., Dinapore, two wooden cannons bound with iron, and a female figure in stone.

9. From M. Natalis Rondot of Paris, commercial delegate attached to the mission of M. de la Grene in China, two copies of his

new work entitled *Vert de Chine et de la Teinture en Vert Chez les Chinois*.

Maharajah Suttish Chunder Roy Bahadoor, and C. Alabaster, Esq., duly proposed at the December meeting, were balloted for and elected ordinary members, and Dr. Max Muller, likewise proposed at the December meeting, was balloted for and elected a corresponding member of the Society.

*Letters were read.*

From Captain F. A. V. Thurburn and B. J. Colvin, Esq., announcing their withdrawal from the Society, and from W. S. Seton Karr, Esq., stating that he had ceased to be a member of the Society at the close of 1853, before his departure for Europe (letter not received.)

The following gentlemen were proposed as members.

Major A. H. P. Stuart Wortley, M. P., proposed by A. Grote, Esquire, seconded by W. S. Atkinson, Esq.

H. Stainforth, Esquire, B. C. S., proposed by A. Grote, Esq., seconded by Col. R. Strachey.

Baboo Kassy Nauth Roy Chowdry, proposed by Baboo Rajendra lal Mittra, and seconded by Baboo Ramapersaud Roy.

H. Scott Smith, Esq., Civil Engineering College, proposed by Dr. W. Crozier, and seconded by E. B. Cowell, Esq.

W. Theobald, Esq., junior, proposed by A. Grote, Esq. and seconded by W. S. Atkinson, Esq.

Lieut. W. G. Alexander of the 93rd Highlanders, proposed by Major H. L. Thuillier, and seconded by W. S. Atkinson, Esq.

Capt. F. W. Stubbs, Bengal Artillery, proposed (for re-election) by Major H. L. Thuillier, and seconded by W. S. Atkinson, Esq.

The Council reported that they had appointed the following Sub-Committees for the year 1859,

*Finance.*

Capt. C. H. Dickens.

Baboo Ramgopaul Ghose.

*Philology.*

E. A. Samuells, Esq.

Rev. J. Long.

F. E. Hall, Esq.

Dr. E. Roer.

Captain W. N. Lees.

Baboo Rajendralal Mittra.

*Library.*

E. A. Samuells, Esq.

Baboo Ramapersaud Roy.

Lieut. Col. R. Strachey.

Captain W. N. Lees.

Captain C. H. Dickens.

Baboo Rajendralal Mittra.

*Natural History.*

Dr. T. Boycott.

E. A. Samuells, Esq.

T. Oldham, Esq.

Dr. T. Thomson.

Dr. W. Crozier.

Lieut. Col. R. Strachey.

H. F. Blanford, Esq.

*Meteorology, and Physical Science.*

The Ven'ble J. H. Pratt.

Major H. L. Thuillier.

Lieut. Col. R. Strachey.

Baboo Radha Nauth Sikdar.

T. Oldham, Esq.

The Council presented a report recommending that the Hon'ble Sir James Colville, Kt., be elected an Honorary member as a mark of respect for his long and zealous services as President of the Society.

*Communications received.*

1. From F. E. Hall, Esq., a paper on certain Sanscrit Inscriptions.

2. From Baboo Radhanauth Sickdar, an Abstract of the Meteorological Observations taken at the Surveyor General's office, during the months of August and September, 1858.

The Curator exhibited a skull with magnificent horns of the Wapite stag, of North America, or miscalled Elke of the Anglo Americans, from California; the specimen sent for the occasion by J. W. Linzee, Esq., of the firm of Dutts, Linzee and Co., American



merchants. The peculiar characteristics of the Wapite, as distinguished from the *Shou* of Thibet and other large stags, were explained, and some observations made on the geographical distribution of the particular group of Deer, in which the *Cervus elaphus* of the British Islands is included.

The Curator also exhibited the lower jaw and other bones of a Dugong, found in an Andamanese hut, and presented to the Society by Captain Niblett of the Steamer *Sydney*. Though inhabiting the Straits of Malacca, he was unaware of this marine animal having previously been met with in the Bay of Bengal. It is not rare, however, in the Gulf of Calpentyu, in Ceylon, and occurs also along the Malabar Coast, where it is miscalled 'Seal' by Europeans. The entire skeleton of an adult, it was remarked, would be a valuable acquisition for the Society's Museum.

Various other donations were announced, as especially some rare bird skins and skeletons from J. H. Gurney, Esq., M. P., of Norwich, and a variety of specimens from the Andamans and interior of the Tenasserim Provinces collected and presented by the Secretary.

Read a paper by Dr. Anderson on the flora of Lucknow and its neighbourhood.

The thanks of the meeting were voted to Dr. Anderson for his interesting communication.

#### *Reduction of Subscriptions.*

Mr. Oldham begged to state for the information of members that the Council had under discussion a proposal for the reduction of the contributions payable by members. He thought it desirable that this should be known as widely as possible.

The Officiating Librarian submitted his usual report for December and January last.

#### LIBRARY.

List of fresh accessions to the Library during December and January.

#### *Presentations.*

Letter to Sir David Brewster, F. R. S., &c. on Results in Terrestrial Magnetism.—By JOHN ALLAN BROWN, F. R. S.

Annalen der Chemie und Pharmacie for August and September, 1858.

The Oriental Christian Spectator for November and December, 1858.—  
BY THE EDITOR.

The Oriental Baptist for December, 1858, and January, 1859.—BY THE  
EDITOR.

Comets and the Comet of 1858. A Lecture by J. Burgess, Esq.—BY  
THE AUTHOR.

The Calcutta Christian Observer for December, 1858, and January,  
1859.—BY THE EDITORS.

Ueber das Catrunjayu Mâhâtmyam, Ein Beitrag zur Geschichte der  
Jaina. Von Albrecht Weber, Leipzig.—BY THE AUTHOR.

Zur Litteratur und Geschichte des Weda, drei Abhandlungen von Ru-  
dolph Roth. Stuttgart, 1846.

Proceedings of the Royal Society of Edinburgh. Session 1857-58.

Indische Studien Band IV. parts 2 and 3.

Journal of the Indian Archipelago. Vol. 2. New Series, No. 4.

Selections from the Records of the Bombay Government. No. 47, Re-  
port on a Project for the supply of Water to the Poona Cantonment.  
With Plans and Sections in a separate case. No. 48, New Series. A short  
Review of Mr. Plowden's Report on the Salt Excise of the Bombay Presi-  
dency. By Nicholas A. Dalzell, Esq.—BY THE GOVERNMENT OF BOMBAY.

Selections from the Records of the Madras Government No. 50. Re-  
port on the Agricultural Exhibitions in the Provinces in the year 1857.  
Desiderata for the Madras Exhibition of 1859.—BY THE BENGAL GO-  
VERNMENT.

Annals of the Indian Administration, Part IX. 1858. Edited by Mere-  
dith Townsend.—BY THE HOME GOVERNMENT.

Bibidhartha Sangraha for Bhadro, 1265.—BY THE EDITOR.

Sanscrit Wörterbuch von Otto Bohtlingk und Rudolph Roth. Bogen  
41—72.—BY THE EDITORS.

The Athenæum for September, 1858.—BY THE EDITOR.

The London, Edinburgh and Dublin Philosophical Magazine and Jour-  
nal of Science. Nos. 107-108 for October and November, 1858.

Journal Asiatique No. 45 for July, and No. 46 for August, September,  
1858.

Zeitschrift der Deutschen Morgenlandischen Gessellschaft. Zwölfter  
Band IV. Heft Leipzig, 1858.

Verhandelingen van het Bataviaasch Genootschap van Kunsten en We-  
tenschappen. Deel 26, Batavia 1854-57.

Tijdschrift voor Indische Taal, Land-en Volkenkunde. New series,  
Deel 3, parts 1 to 6. Batavia.

Proeve van Soendasche Poezij (sindirís) Door K. F. Holle.

A Lecture on Surveys and Surveying, by Captain Walter S. Sherwill. F. G. S.

Journal of the Agricultural and Horticultural Society, Vol. X. p. II.—  
BY THE SOCIETY.

Bombay Magnetical and Meteorological Observations, 1857.—BY THE  
BOMBAY GOVERNMENT.

Reports of the Juries of the Madras Exhibition of 1857.—BY THE  
BENGAL GOVERNMENT.

Memoirs of the Geological Survey of India, Vol. I. Part 2.—BY THE  
GOVERNMENT OF INDIA.

Notice du Vert de Chine et de la Teinture en Vert chez les Chinois.  
*Paris*.—BY M. NATALIS RONDOT.

*Purchased.*

Revue des Deux Mondes, Tomes 25 to 28, 1858.—Paris.

— et Magazin de Zoologie, Nos. 8 and 9, 1858.

Annals and Magazine of Natural History, Nos. 10 and 11, for October,  
and November, 1858.

Annales des Sciences Naturelles, Tome VIII. and IX. No. 1.

Comptes Rendus, Nos. 10 to 18, 1858.—Tables des do. Tome XLVI.  
for 1858.

The Westminster Review for October, 1858.

Analectes sur l'Histoire et la littérature des Arabes D'Espagne par Al-  
Makarri. Tome 2, p. 1.

Kitabe Seerute Rosoul Allah, by M. Ibn Ishák, translated by Dr. Fer-  
dinand Wüstenfeld, Gottinger, Erste and Zweite Abtheilung for 1857-58.

Useful Plants of India. By Major Heber Drury, 1858, Madras.

Journal Des Savants, for September and October, 1858.

Edinburgh Review for October, 1858.

Quarterly Review for October, 1858.

The Literary Gazette, Nos. 16 to 19. New series.

American Journal of Science and Arts, No. 77, September, 1858.

The Natural History Review, No. 4, for October, 1858.

Precis de Jurisprudence Musalmane, Par Sidi Khalil, Deuxieme Tirage.  
Paris, 1858.

LIBRARY.

List of Books received in February, 1859.

*Presented.*

Essays on the Religion and Philosophy of the Hindus. By H. T. Cole-  
brooke, Esq.—BY MESSES. WILLIAMS AND NORGATE.

Calcutta Christian Observer for February, 1859.—BY THE EDITORS.

Oriental Baptist for February, 1859.—BY THE EDITOR.

Selections from the Records of the Madras Government, No. 51, Re-

port on Vaccination. No. 52, Rules respecting applications for Grants-in-aid of Schools unconnected with Government.—BY THE HOME GOVERNMENT.

Ditto No. 53, Papers relating to the General Revenue Survey of the Madras Presidency.—BY THE MADRAS GOVERNMENT.

A Catalogue Raisonnee of Oriental Manuscripts in the Library of the (late) College Fort Saint George now in charge of the Board of Examiners, 1857. By the Rev. Wm. Taylor, 2 copies.—BY THE SAME.

Selections from the Records of the Bengal Government, No. 29. Report on the Rivers of Bengal, by Capt. W. S. Sherwill. Papers of 1856-57 and 58 on the Damooda Embankments 2 copies.—BY THE BENGAL GOVERNMENT.

Memorandum on the Province of Assam, by G. R. Barry.—BY WM. SMOULT, ESQ.

On the Nature and Use of the Indian *Bael* in Diarrhœa, Consumption, &c.—BY HENRY REMFRY, ESQ.—BY THE AUTHOR.

Journal Asiatique, No. 47, for October, November, 1858.—BY THE ASIATIC SOCIETY, PARIS.

Annalen der Chemie und Pharmacie for October and November, 1858.

The Athenæum for December, 1858.

The London, Edinburgh and Dublin Philosophical Magazine, Nos. 110 and 111, for January, 1859.

*Purchased.*

Revue des Deux Mondes, 15th November, 1st and 15th December, 1858, and 1st January, 1859,

Annuaire des Deux Mondes, 1857-58.

Annales des Sciences Naturelles. Tome 9, Nos. 2, 3, and 4.

Comptes Rendus, Nos. 19, to 26, 1858, and No. 1 for January, 1859.

Literary Gazette, Nos. 20, to 29 New Series, 1858.

Annals and Magazine of Natural History. Third series, Vol. 2, Nos. 12, and 13, for December, 1858, and January, 1859.

Journal of the Statistical Society, London, for December, 1858.

Revue et Magasin De Zoologie, Nos. 10 and 11, 1858.

Proceedings of the Royal Geographical Society of London for October, 1858.

Mutanabbii Carmina Cum Commentario Wádhidii, Fasc. 2. Berlin, 1858.

The Athenæum for November, 1858.

Reis naar het Oostelijk Gedeelte van den Indischen Archipel. in het jaar, 1821; Amsterdam, 1858.

Journal des Savants for November and December, 1858.

Lieder des Hafis, Vol. II. Part 1, by Dr. Hermann Brockhaus, 1858, Leipzig.

## FOR MARCH, 1859.

The Monthly General Meeting of the Asiatic Society of Bengal was held on the 2nd instant.

Lieutenant-Colonel Strachey, Vice-President, in the Chair.

The proceedings of the February meeting were read and confirmed.

Presentations were received.

1. From the Home Government of India, certain copies of Selections from the records of the Madras Government.

2. From the Bengal Government, certain copies of Selections from the records of the Bengal Government.

3. From W. H. Smoult, Esquire, a copy of "Memorandum on the Province of Assam" by G. R. Barry, Esq.

4. From Henry Remfry, Esq., Attorney at Law, a copy of his tract "On the Nature and Use of the Indian *Bael* in Diarrhœa, Consumption, &c."

5. From Captain H. Strachey, five rare MSS.; viz., 3 vols. of the Persian Tarikhi Hyderi, by Mirza Hyder, and the Diwans of two Turki poets.

6. From D. I. Money, Esq., B. C. S., 4 Sepulchral Alabaster Urns found in Thebes, in 1846.

The following is an extract from the letter accompanying them:—

"MY DEAR ATKINSON,—I brought with me from Thebes in 1846, four Sepulchral Alabaster urns, which were found in a tomb not far from the Tombs of the Kings. They contained some part of the human body mummied, but the contents in moving about have been lost. The top of each is separate, and represents one of the Egyptian deities. You can easily recognize their Jupiter Ammon, Anubis, and the Cynocephalus, and the 4th must be familiar to the Asiatic Society, to whom I wish you to present them. One of the urns has been broken and another repaired. There are therefore only three, with four tops; one has a saucer at the bottom on which the urn rested."

The thanks of the Society were specially voted to Mr. Money for these valuable presents.

The following gentlemen were named for ballot at the next meeting:—

The Bishop of Calcutta, proposed by Mr. W. S. Atkinson, seconded by Dr. T. Thomson.

Sir Mordaunt Wells, proposed by Sir J. Colville, seconded by Mr. W. S. Atkinson.

Lieutenant-Colonel Baird Smith, proposed for re-election by Mr. W. S. Atkinson, seconded by Dr. T. Thomson.

Baboo Nundolala Bose, proposed by Baboo Rajendralal Mittra, and seconded by Baboo Jadaba Krishna Singha.

A letter was read from Rev. W. O'Brien Smith announcing his withdrawal from the Society.

The Hon'ble Sir James Colville was balloted for and elected an Honorary Member.

The following gentlemen duly proposed at the last meeting were ballotted for and elected ordinary members.

Major A. H. P. Stuart Wortley, M. P.

H. Stainforth, Esq., B. C. S.

Baboo Kassynauth Roy Chowdry.

H. Scott Smith, Esq., Civil Engineering College.

W. Theobald, Esq., junior.

Lieutenant W. G. Alexander of the 93rd Highlanders.

Captain F. W. Stubbs, Bengal Artillery (re-elected).

Mr. E. B. Cowell read a paper on the traces of the *Swayamvara*, an Indian form of Royal marriage, as found in different parts of the ancient world.

The thanks of the meeting were voted to Mr. Cowell for his interesting communication.

The Officiating Librarian and the Zoological Curator submitted their usual reports.

## FOR APRIL, 1859.

The Monthly General Meeting of the Asiatic Society of Bengal was held on the 6th instant.

Fitz Edward Hall, Esq., senior member present, in the chair.

The proceedings of the last meeting were read and confirmed.

*Presentations were received :*

1. From George Loch, Esq., B. C. S., ten Jeypore marble Figures of Hindu Divinities, some of them partially mutilated.

2. From the Royal Institution of Great Britain, the Proceedings of the Institute.

3. From the Madras Government, No. LIV. of the Selections from the records of that Government.

4. From the Home Government, No. XVIII. of the Selections from the records of the Bombay Government.

The following gentlemen duly proposed at the last meeting were ballotted for, and elected ordinary members :

The Bishop of Calcutta.

Sir Mordaunt Wells.

Lient.-Col. Baird Smith (re-elected).

Baboo Nundolal Bose.

The following gentlemen were named for ballot as ordinary members, at the next meeting.

The Hon'ble G. F. Edmonstone, B. C. S., proposed (for re-election) by A. Grote, Esq., seconded by W. S. Atkinson, Esq.

E. C. Bayley, Esq., B. C. S., proposed by A. Grote, Esq., seconded by W. S. Atkinson, Esq.

The Council also proposed Dr. P. Bleeker, of Batavia, as a corresponding member of the Society.

*Letters were read :*

1. From the Hon'ble Sir James Colville, Kt., tendering his thanks for the honor conferred on him by the Society, in electing him an honorary member.

The letter is as follows :

"MY DEAR SIR,—I have to acknowledge the receipt of your letter of the 9th instant, announcing my election as an honorary member of the Asiatic Society of Bengal.

"I beg you to express to the Society my high sense of the honor it has done me in conferring upon me this far more than adequate reward for my poor services as its President.

"I have, &c.,

(Signed) "J. W. COLVILLE."

"W. S. ATKINSON, ESQ."

*Communications were received :*

1. From Captain H. Strachey, some additional memoranda upon the fate of Herr Adolphe Schlagintweit, with a suggestion that the Society should address the Government to enquire whether any steps have been taken officially to ascertain the fate of the traveller, and to recover his papers and property.

*Note by Capt. H. Strachey.*

The proceedings of the Asiatic Society for November, 1858, contain a memorandum by Capt. H. Strachey, dated 20th August, regarding the fate of Herr Adolphe Schlagintweit, and the recovery of his collections, instruments, and manuscripts. Captain Strachey has subsequently obtained some further information on the same subject, which is given in the accompanying memorandum, No. 2, dated January, 1859. This information is still very meagre, but goes to confirm the other numerous reports of the traveller's death, as given in the annexed extracts from the up-country newspapers.

As it does not appear that Government has yet taken any steps for the recovery of Schlagintweit's effects, or of instituting more particular enquiries regarding his fate, as suggested in the concluding paragraphs of Captain Strachey's first memorandum, or otherwise, it is recommended that the Asiatic Society do address the Government on the subject, and solicit their action.

In the continued absence of instructions from Government Captain H. Strachey has now himself collected and forwarded to Messrs. H. and R. Schlagintweit in Berlin, all manuscripts recovered in Kumaon, and such of the instruments (chiefly German Thermometers) as appeared to be worth transmission. None of the collections have come within his reach.

*Memorandum No. 2.*

Man Singh and Nain Singh Milmal of Jwar in Kumaon, left Adolphe Schlagintweit at Peshawur at the end of December, 1856,



or beginning of January, 1857, and returned to their own country during the next three months, making a few observations by the way. After this they had no further communication with him, excepting by a message sent in March, 1857, through Capt. H. Strachey, 66th Ghorka Regt., which requested Man Singh to join Adolphe Schlagintweit again, either at Kangra in April, or later in Ladak, which, however, Man Singh did not attempt.

Going as usual to the Gar fair, in the summer of 1857, Man Singh heard only some vague reports about Adolphe Schlagintweit from traders of Ladak, the substance of which is given in the 9th paragraph of memo. No. 1.

In December, 1857, Man Singh received a packet of thermometers, &c., with sundry notes from Hermann Schlagintweit, through Mr. B. Colvin, Assistant Commissioner of Kumaon. These had been sent from Calcutta in April of that year, but owing to the disturbed state of affairs in Upper India soon after, and Man Singh's absence in Bhotan, their delivery was delayed till his return to the lower hills at the end of the year. He made little or no use of these instruments since, and ultimately returned them to Captain Strachey.

In September, 1858, Man Singh, being again at the Gar fair, got some further information about Adolphe Schlagintweit, chiefly from one *Nurpur*, a native of Sunam in Kumaon of Bischir, trading to Ladak and Yarkund. This person was himself at Yarkund in 1857. When Adolphe Schlagintweit arrived in that quarter the Turks of Khokund, were already at or near the city. Adolphe Schlagintweit himself did not enter the town, but his guide, Mahomed Amin, did so, and left it again, either before or during the siege, under what relations with his own master or with the Turks was not known to informant.

As the siege continued, and the Chinese were shut up in their citadel, they obliged sundry of the inhabitants of the place to take part in the fighting; among others, a lot of foreign merchants, including about forty-five (45) of the Bischris, of whom 15 only returned, informant *Nurpur* being one of them; the rest were either killed or made prisoners.

After the siege was raised, informant heard that Adolphe

Schlagintweit had joined the camp of the Turks, and been at first well received by them; and on their retreat towards Khokund, he accompanied them as far as Kashghar. As they were carrying off with them a lot of their prisoners to be kept or sold for slaves (according to the custom of Turkistan), some of the Bischris being among the number, Adolphe Schlagintweit remonstrated that they were British subjects and should be released. On this arose a dispute; the Turks accused Adolphe Schlagintweit of taking part with their enemies, and ended by killing him.

Informant had certificates from the Chinese Authorities of Yarkund, testifying his services in the siege, and promising him some reward at a future opportunity.

The above account of the Bischri *Nurpur* was confirmed by one *Uniar*, an Argon of Ladak, who had received letters from his friends at Yarkund to the same effect.

*Recovered from Man Singh.*

- |      |   |                                                                                                                                                  |
|------|---|--------------------------------------------------------------------------------------------------------------------------------------------------|
| 1 .. | { | 1 Boiling Thermometer (German).                                                                                                                  |
|      | 2 | Ground ditto in cases ditto.                                                                                                                     |
|      |   | {                                                                                                                                                |
|      |   | 1 Large Newman's Thermometer (broken).                                                                                                           |
| 2 .. | { | 1 Boiling Apparatus, in box.                                                                                                                     |
|      | 1 | Old Geneva Watch.                                                                                                                                |
|      | 1 | Small Magnifying Glass.                                                                                                                          |
|      |   | {                                                                                                                                                |
| 3 .. | { | 1 Set of observations on temperatures of rivers and wells in the Punjab and Rohilkund, &c., from January to March, 1857; and a few other papers. |

Of these, 1 and 3 have been kept by Capt. Strachey to send home, and 2 left with the Assist. Commissioner at Almora, being of no further use.

(Sd.) H. STRACHEY,

*Capt. 66th Goorkha Light Infantry.*

*Almora, January, 1859.*

*Newspaper Extracts referring to the above, furnished by Captain Strachey.*

“A letter written from the borders of Thibet, informs us, we are sorry to say, of there being no doubt of the murder of the enterprising and scientific traveller, Mr. Adolphe Schlagintweit. This, it now appears, took place at the end of the past, or beginning of the present year. It has, however, only become recently known, at

least publicly so, in this country, though it would appear to have been communicated to the friends of the deceased gentleman in Germany so far back as April last ; his death having been sent to Europe from Lahore, where it was known through official letters received from Cashmere. ‘ Why,’ asks our correspondent, ‘ was this not made known to the public generally ?’ Our present information is very scanty, but is to the effect that Mr. Schlagintweit was murdered by a plundering party of Khokund people, who suspected that he was connected with their enemies, the Chinese. None of Mr. Schlagintweit’s instruments or papers have yet been discovered, though people have been sent in search of them, and some have, it is supposed, been taken by servants by the Cashmere route.

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“Some short time ago, we announced that the enterprising and scientific traveller, Herr Adolphe Schlagintweit, had been murdered, and we now find confirmation of the fact in an extract from the letter of the Simla Correspondent of the *Evening Mail (Times)* of the 17th ultimo, as follows—

“From the same source, positive, and, I fear, authentic information has been received of the death of the adventurous explorer and naturalist, Adolphe Schlagintweit, one of the three brothers already so well known for their scientific researches, pursued under the auspices of the East India Company in India and among the Himalayas. Although rumours of his death, some accompanied by circumstantial details, have been for some time circulated, they were not known to rest on any good authority. It appears that a party of Khokundhis belonging to a tribe which was in revolt against the Chinese, came into the Yarkund territory early in the spring, and drove the few Chinese troops in the villages into the town of Yarkund. In one of the villages near the town, the Khokundhis found Schlagintweit residing, and in the course of conversation he asked them why they did not attack Yarkund itself, where the Chinese force was so small, and they were so numerous. For some unexplained reason they were offended at this question. They retired and held a consultation, the result of which was that they decided he must be a friend of the Chinese, and wished to ensnare them ; and in the dead of night they surrounded his house and killed him, to the great regret of

their chief, who has saved some of the unfortunate traveller's instruments. The letter contains a few details respecting his collections and the movements of his retainers, which I have forwarded to one of the most eminent of our English *savans*, as perhaps the information is not of sufficient general interest for newspaper readers. Major Lake on one side of the Sutlej, and Lord William Hay at the other, will no doubt exert themselves to get the most complete information respecting the manner of his death, and to secure his valuable collections, instruments, and papers. Some of his followers left for Cashmere, others for the Cis-Sutlege, before the snows set in, for the purpose of making observations."

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From reliable information received from the Commissioner Trans-Sutlege States, we fear but little doubt now remains as to the fate of Mr. Adolphe Schlagintweit. It appears that he was taken prisoner by the Indijans about 12 or 14 months ago, and, if not killed, is still in captivity."

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The Secretary reported that the Council recommended that Capt. H. Strachey's suggestion be adopted, and moved "that the Society do address the Government accordingly."

This resolution having been seconded was put by the chairman and carried unanimously.

2. From Baboo Radha Nauth Sikdar, an Abstract of the Meteorological Observations taken at the Surveyor General's Office, Calcutta, for the month of October, 1858.

*Reduction of Subscription.*

The Council submitted the following report :

"The Council have again taken into consideration the rates of subscriptions of members, with a view to their reduction.

They have long felt that such a measure was on every account most desirable, provided only it could be effected without serious danger to the financial credit of the Society.

An apprehension that the immediate loss of income, which any reduction must occasion, would cause serious embarrassment, and the uncertainty how soon, if ever, the influx of new members would be sufficiently large to restore the balance, has hitherto deterred the Council from recommending any reduction.

The great importance, however, of widening the basis of the society, and obtaining for it a more general support, has been so frequently and urgently pressed upon them, that, after much anxious consideration, they have at length agreed to recommend that the experiment should be tried, trusting that a large accession of members may justify the anticipations of its advocates.

The Council have come to the conclusion that, if any reduction is made, it ought to be a considerable one, in order that the measure may obtain any fair chance of success.

The rules which fix the present rates of payment are as follows :

Rule 8.—Ordinary members shall pay an admission fee of Rs. 32 and a quarterly payment of Rs. 16 in advance, commencing from the quarter in which they are elected, so long as they are resident in India. These rates to be continued for 2 years, and to be then subject to revision.

Rule 10.—It shall be optional for any member to compound for the quarterly contributions by the payment of 500 Rs.

Rule 11.—All sums so paid shall be invested in Company's paper, and kept as a reserve fund, the interest of which alone shall be appropriated to the current expenses of the Society.

The Council propose to rescind these rules and substitute for them the following.

“ Ordinary members shall be divided into two classes,—one *Resident*, one *Non-resident*.

“ All members who reside within 30 miles of Calcutta shall be deemed *Resident*.

“ *Residents* shall pay an admission fee of Rupees 32, and a quarterly payment of Rs. 12.

“ *Non-residents* shall pay an admission fee of Rupees 32, and a quarterly payment of Rs. 6.

“ All payments to be made in advance, commencing from the quarter in which members are elected, and continuing so long as they are resident in India.”

At present the number of paying members is 102, of whom about one-half are resident. Supposing this proportion between residents and non-residents to be maintained in future, the Council have calculated that 200 members of both classes will be required in order to provide for the present necessary expenditure of the Society.

## EXPENDITURE.

|                                                              |       |
|--------------------------------------------------------------|-------|
| General charges for Library, Museum and Establishment, ..... | 6000  |
| Journal,—say.....                                            | 1200  |
|                                                              | <hr/> |
|                                                              | 7200  |

## INCOME.

|                                    |       |
|------------------------------------|-------|
| 100 Residents at Rs. 48, .....     | 4800  |
| 100 Non-Residents at Rs. 24, ..... | 2400  |
|                                    | <hr/> |
|                                    | 7200  |

The present number of members must therefore be nearly doubled, if the Society is to be enabled to maintain the position it now occupies.

The Council do not disguise from themselves that the measure they are proposing is one which is not free from risk. They are satisfied that it *ought* to be successful, but they are no less impressed with a conviction that to ensure success a resolute effort is necessary.

They therefore make an earnest appeal to all the members of the Society, and more especially to such as have been the active promoters of a reduction, that in the event of the measure being carried, they will use all their influence to obtain for the Society that enlarged support without which its resources must be seriously crippled, and its usefulness proportionally impaired.

The Council entertain the fullest confidence that this appeal will be responded to by all who have at heart the welfare of the Society and the advancement of science and literature in India; and with this conviction they have no hesitation in recommending the proposed measure to the adoption of the Society."

The Secretary proposed that the ordinary general meeting in July be made special for the consideration and final decision of the question, and that in the interval the votes of non-resident members be taken, in compliance with rule 45.

This resolution was put and carried.

The Curator exhibited the skull of a Tibetan *Kyang* (or so called 'wild Horse'), together with that of a *Ghor-khur* (or so called

‘wild Ass’), from Bikanir, lent to him for that purpose by Major Robert C. Tytler.

#### LIBRARY.

List of books received for the April meeting.

#### *Presentations.*

The Athenæum for January, 1859.

London, Edinburgh and Dublin Philosophical Magazine, No. 112, February, 1859.

Journal Asiatique, No. 48, December, 1858.—BY THE ASIATIC SOCIETY OF PARIS.

Proceedings of the Royal Institution of Great Britain, Part VIII. November, 1857, to July, 1858.—BY THE ROYAL INSTITUTE.

Memorandum of Col. A. Cotton on a Railway from Beikul Harbour to Hydrabad.—BY THE MADRAS GOVERNMENT.

Bibidharta Sangraha for Kartic, No. 55.—BY THE EDITOR.

Oriental Christian Spectator for January and February, 1859.—BY THE EDITORS.

Calcutta Christian Observer for March, 1859.

Oriental Baptist for March, 1859.

Selections from the Records of the Bombay Government, Continuation of No. XVIII. New series, Revenue Settlement in the Province of Sind.—BY THE HOME GOVERNMENT.

Selections from the Records of the Madras Government, No. LIV. Papers relating to the Budget of Public Works for 1857-58.

The Calcutta Review for March, 1859.

#### *Purchased.*

Journal des Savants for January, 1859.

Comptes Rendus, Nos. 2, 3 and 4 for January, 1859.

Literary Gazette, Nos. 30 to 33 for January and February, 1859.

Revue des Deux Mondes for 15th January and 1st February, 1859.

Annales des Sciences Naturelles. Tome IX. No. 5.

Annals and Magazine of Natural History, Vol. III. No. 14.

Westminster Review, No. 29, January, 1859.

The Quarterly Review, No. 209, January, 1859.

The Edinburgh Review, No. 221, January, 1859.

American Journal of Science and Arts, Nos. 78 and 79, November 1858, and January, 1859.

Revue et Magasin de Zoologie, No. 12, 1858, and No. 1, 1859.

Catalogue Annuel de la Librairie Francaise, pour 1858, par Ch. Reinwald.

El-Azraki's Stadt Mecca, by Ferdinand Wüstenfeld, Leipzie. Erster Band, 1858.

Natural History Review and Quarterly Journal of Science, Vol. VI. No. 1, January, 1859.

Memoires sur les Contrees Occidentales par M. Stanislaus Julien. Tome II. Paris, 1858.

Le Boustan de Sâdi, Texte Persan avec un commentaire Persan, par Ch. H. Graf. Vienne, 1858.

Opuscula Arabica by William Wright, 1859.

Avesta die Heiligen Schriften der Parsen Von Dr. Friedrich Spiegel, Zweeter Band, Leipzig, 1859.

Dorin, Bernhard. History of the Afghans, from the Persian of Neamut Ullah, London, 1836.

Weber, Dr., Catrunjaya Mahatmyam, Band I. No. 4, Leipzig, 1858.

#### FOR MAY, 1859.

The Monthly General Meeting of the Asiatic Society of Bengal was held on the 4th instant.

E. A. Samuells, Esq., senior member present, in the chair.

The proceedings of the last meeting were read and confirmed.

Presentations were received:—

1.—From Chaloner Alabaster, Esq., some Chinese curiosities in two boxes.

2.—From Mons. Garcin de Tassy, Paris, copy of a pamphlet on the Bostan of Sadi.

3.—From Devidyal Singh, of Benares, through Pundit Iswara Chundra Bidya Sagara, a copy of Manava Dhurma Prokash, or Menu Smriti Ka Vasha, being a Hindi translation of the Institutes of Menu.

4.—From the Bombay Government, No. XLIV. of the Selections from the records of that Government.

The following gentlemen duly proposed at the last meeting were balloted for and elected ordinary members :

The Hon'ble G. F. Edmondstone, B. C. S., Lieut.-Governor, North-western provinces (re-elected).



E. C. Bayley, Esq., B. C. S.

Dr. P. Bleeker was elected a corresponding member.

Major R. Tytler, proposed by Mr. Atkiuson and seconded by Mr. Samuells, was named for ballot as an ordinary member at the next meeting.

The Council submitted the following report:—

The Council beg to recommend that Rule 49, which directs that “no person shall be proposed or elected a member of the Society on the day of the annual meeting,” be rescinded.

The annual meeting is devoted specially to business matters relating to the general affairs of the Society; but there is no apparent reason why the election of members, which is strictly a matter of business, should be prohibited.

Practically the rule has been found for the last two years extremely inconvenient. In both years several candidates who had been proposed in December stood over for election till February, and in the former of these years, 1857-58, one candidate who was anxious to be elected in order to make use of the Library expressed annoyance at the delay.

The Council therefore propose to rescind the rule; and as an appeal to non-resident members is in this case necessary under Rule 45, they recommend that the votes of such members be at once taken, so that the question may be disposed of at the special meeting which is to be held after the disposal of the ordinary business on the first Wednesday in July.

Communications were received:

1.—From Messrs. Hermann and Robert Schlagintweit.

A Circular note in reference to the fate of Herr Adolphe Schlagintweit.

The note is as follows:—

SIR,—Lord Stanley, the Secretary of State for India in Council, has been kindly pleased to send us for our information a most carefully compiled collection of official papers and memoranda, which the Government of India as well as several Civil and Military Officers have been good enough to collect in the hope of elucidating the fate of our brother Adolphe Schlagintweit, in charge of the Magnetic Survey of India since 1854.

The papers contain :

1. A large and most elaborate memorandum, which Capt. Henry Strachey, 66th Gorkhas, has given himself the great trouble to compile, partly from evidences of several Natives, partly from notes contained in the Indian newspapers. This memorandum is accompanied by another most valuable communication, the result of Capt. Strachey's indefatigable personal inquiries.

2. Letters from the Dewan of Kashmir to the Chief Commissioner of the Punjaub.

3. Several evidences taken by Major Lake and Messrs. Knox and Taylor, the Civil Officers of the Kangra District.

Besides these official letters, the following gentlemen obliged us by private communications :

a.—Rev. H. Jäschke, Missionary at Kyelong in Lahoul with whom, before starting for Ladak, Adolphe had the pleasure of staying some weeks. The Rev. gentleman also was kind enough to take charge of a part of his luggage, and of such spare instruments which Adolphe did not think advisable to take with him on his journey to the North.

b.—A. C. Gumpert, Esq. Consul of Hamburg and Oldenburg at Bombay who had kindly put himself in communication with several officers of the Panjáb and regularly forwarded us the results of his inquiries.

c.—Lord Elphinstone, Lord Hay, Major Ramsay, Hon'ble W. Elliot, L. Bowring, Esq., W. Russel, Esq., the particularly well informed special correspondent of the *Times* and some other gentlemen, equally obliged us, when occasion presented itself, with their advice and information, in addition to that which we owed to the Indian press. In England especially, Col. Sykes, M. P., and Sir Roderick Murchison communicated us any letters they had received ; in Germany it was chiefly our celebrated and most kind friend, Baron Humboldt, who assisted us in making our inquiries.

From an examination of these papers there is but too much reason to fear that Adolphe Schlagintweit has lost his life in Central Asia, probably in Kashgar after having left Yarkand.

Capt. Strachey's last memoir, Almora, January, 1858, says :

" After the siege of Yarkand was raised, Adolphe Schlagintweit

had joined the Camp of the Turks and accompanied them as far as Kashgar. As they were carrying off with them a lot of their prisoners to be sold for slaves, some of the Bissahirs being among the number, Adolphe Schlagintweit remonstrated that they were British subjects and should be released. On this arose a dispute. The Turks accused Adolphe Schlagintweit of taking part with their enemies and ended by killing him."

A quite recent letter from December 31st, 1858, to January 11th, 1859, from Mr. Vardouguine, Russian Officiating Consul at Tchougoutchak in the Russian part of Central Asia, seems also to confirm his death. We received this letter through the energetic exertions of Prince Gortschakoff and it was delivered to us by Baron Budberg, the Russian Minister at Berlin. This letter had taken an admirably short time to reach us, being the answer to a request of November 8th, 1858. In this letter he is said to have been killed by order of Bouzrook Khan from Kokand who had besieged Kashgar and invaded Turkistan.

We feel most deeply obliged for all these numerous proofs of general sympathy in Europe and India, and we allow ourselves to draw the attention of our friends in India to the fact, that even now it will not be quite impossible to save at least through their zeal a great part of his journals, observations, instruments and collections, which are the more valuable on account of the countries in which they were made.

Capt. Henry Strachey states, that according to information he received, several boxes with collections, drawings, books and some instruments are in Dehra in the Surveyor General's Office; the Missionaries of Lahoul have informed us that similar objects are still left in their charge; we do not think it improbable that even those, which Adolphe Schlagintweit carried with him, during his travels in Turkistan, might be recovered by a plan we have the honor to propose.

We are perfectly aware, that these objects cannot be got without Government's usual energetic assistance, and without the sanctioning the comparatively small expenses necessary for this purpose. In consequence of the following extract of a letter addressed to us by the India House as early as July, 1858, we consider it our duty again officially to request the kind assistance of Government.

The letter says :

With reference to the letter addressed by General Sabine to the Secretary of the Royal Society, dated 14th May, 1858, in which he states " that the eighty stations visited by the Messrs. Schlagintweit are independent of those visited by Adolphe Schlagintweit in his last and fatal journey of which they have a prospect of receiving a journal and observations," the Court expect that you will use every exertion to recover your late brother's Memoranda of the researches on which the Government of India employed him.

(Signed) J. D. DICKINSON.

We therefore have the honor to propose in reference to his manuscripts and collections :

1. That the objects at Dehra be repacked in accordance with Capt. Strachey's plans.

2. That the Missionaries at Lahoul be requested to send at Government's expense from Lahoul to Kangra the collections, observations and instruments, &c., and to draw up a report, specifying the claims to which Hari Chand, the son of the Negi of Lahoul is entitled, for the journeys he undertook last summer in search of our brother.

3. That a note may be issued to the Lieut.-Governor of the Punjaub and to the Commissioners of Kamaon, Simla and Kangra authorizing them to distribute freely circulars in the vernacular languages among the trading people of their districts, promising a reward for any papers, drawings, instruments or other property of Adolphe Schlagintweit delivered to them, the amount of remuneration being dependent on the nature and quantity of the property restored. It is beyond all doubt, that the traders would carry on such circulars to Kashmir, Ladak and the countries of Central Asia which Adolphe Schlagintweit has visited.

4. That all the instruments, collections and observations thus recovered, be forwarded to us, if small parcels, overland to Berlin, if boxes, to London, addressed " Schlagintweit, India House," for being worked out and put up like our other collections.

Finally we have the honor to add that copies of this circular note have been officially dispatched,—

To the India House, London; to the Seats of Government in India; and to the following officers and gentlemen in India.

Col. R. J. H. BIRCH, Calcutta.

L. BOWRING, Esq., Private Secy. to the Governor-General.

The Commissioners of Kamaon, Kangra and Simla.

G. EDMONSTONE, Esq., Calcutta.

Hon'ble WALTER ELLIOTT, Madras.

A. C. GUMPERT, Esq., Bombay.

Rev. JASCHKE, Lahoul.

W. MUIR, Esq., Allahabad.

Col. RAMSAY, Nepal.

W. RUSSEL, Esq., Oude.

The President of the Asiatic Society, Calcutta.

Major RICHARD STRACHEY, Ditto.

Capt. HENRY STRACHEY, Ditto.

Col. WAUGH, Mussoori.

We have the honor to be, Sir,

Your most obedt. Servts.,

(Signed) H. and R. SCHLAGINTWEIT.

The secretary stated that before this circular had reached him he had written a letter to Government on the subject, in accordance with the resolution agreed to by the Society at the last meeting.

He begged to read the letter, which was as follows :

“FROM THE SECRETARY TO THE ASIATIC SOCIETY OF BENGAL.

“To C. BEADON, Esq.

“*Secy. Govt. of India, Foreign Department.*

“SIR,—I am directed by the Asiatic Society of Bengal to address you in reference to the fate of the lamented traveller, Herr Adolphe Schlagintweit.

“From intelligence which has been received, there is unfortunately little room to doubt that this gentleman was murdered by a party of Turkomans near Yarkand, at the end of 1857, or the beginning of 1858.

“Accounts of his death have been derived from various sources, but it does not appear, from the information which has reached the Society, that any steps have been taken by the Government officially to ascertain the particulars of his fate, or to recover his papers and

collections, which must be of very considerable interest and importance.

“The Society have therefore directed me to inquire whether the Government have at present moved at all in this matter, and if they have not done so, to express a hope that they will at once take such steps as may be desirable to ascertain the circumstances attending his death more accurately, and if possible to recover his papers and property, thus showing that the Government of India does not regard with indifference the fate of a gentleman employed in the public service, who lost his life in the prosecution of scientific discovery and research.

“I have, &c.,

“(Sd.) W. S. ATKINSON,

“*Secy. Asiatic Society.*”

2.—From Professor Mäx. Muller, of Oxford, a paper on the origin of writing in India, and the probable period at which it came into use for literary purposes.

3.—From Baboo Radhanauth Sikdar, Abstract of the results of the hourly meteorological observations taken at the Surveyor General's Office, in the month of November last.

4.—From E. Blyth, Esq., a paper on the cartilaginous fishes of Lower Bengal.

5.—From the same, a paper containing remarks on the different animals known as wild asses.

6.—From the Secy. to Government, Public Works Department, a paper by Capt. Henderson, on the nature and effects of the recent flood of the Indus.

This paper was read by the Secretary, together with a note by Col. R. Strachey, who differed from Capt. Henderson as to the probable origin of the flood. Some discussion ensued, in which Capt. Yule, Col. Baird Smith, Mr. Oldham, and others took part.

The general impression was that the catastrophe which caused the inundation must have occurred in the neighbourhood of Acho, not far from the Gilgit valley, and not towards the head waters of the Nubra or Shayook, as supposed by Capt. Henderson.

Mr. Samuells read the following note upon the wooden guns taken at the battle of Berhampore by Col. Dunsford in October, 1858, and which he lately presented to the Society :—

“In the proceedings at the February meeting, as published in the newspapers, it is stated that the two wooden guns now before the meeting were presented by me to the Society on behalf of Col. Rowcroft. This is a mistake, arising probably from Col. Rowcroft having last year made me the medium of presenting a chair of state, and other articles, which he had captured at Suttasee in Goruckpore.

“These wooden guns were taken by the force under Col. Dunsford at Berhampore, a place on the road between Buxar and Arrah, where the rebels were signally defeated towards the end of October last. They had no carriages, and were simply laid on raised beds of earth, and pointed over a low wall so as to command the road up which it was supposed our troops would advance.

“The maker, a Nepalese, it is understood, had guaranteed that they should stand three discharges without bursting; but in fact they both burst at the very first discharge. A large piece was blown out of the side of one, which is said to have killed a sepoy in the firing, and the others fairly broke into two pieces.

“These were the only two wooden guns which the rebels ever finished, but several others were found in course of construction at Jugdispore, when the place was captured. The mode of construction was peculiar. The guns, it will be observed, are fashioned out of solid blocks of saul timber, and in order to facilitate the labour of boring and get rid of the sawdust, the blocks were suspended from one end, and allowed to rest on the point of the augur, which was worked from beneath by means of the common native bow. The guns were about six feet in length, and were bored to about two-thirds of their length. A copper cylinder was then inserted as a lining, but it appears to have had no base, and this was probably the chief cause of the destruction of the gun, as the powder must have got in behind the cylinder, and forced the copper forward in a crumpled state when the gun was fired. The diameter of the bore is  $4\frac{1}{4}$  inches, and of the block from 9 inches at the muzzle to 12 inches at the breech. It was bound with stout hoops of iron at distances of a few inches apart, and with rope between the hoops. The whole was covered with leather, which, however, had disappeared before the guns came into my possession.

“I have only to add that after the battle of Berhampore the guns

were removed to Buxar, by Mr. Garstin, the Deputy Magistrate at that place, and that I obtained them from him. He informed me that there were several balls of hammered iron belonging to them lying at Doomraon, and promised to forward them, but they have not yet reached me.

“ We have notices of several wooden guns having been observed in Burmah and China, but this is, I think, the first instance of guns of this description having been employed in Indian warfare.”

Major Robert C. Tytler exhibited some fine Positive Photographic illustrations of Indian Architecture and scenery, of which the Negatives as well as the Positives were taken by Mrs. Tytler and himself, chiefly in the Upper Provinces. The pictures were of great beauty and of an extraordinarily large size, being the full size of Hollingsworth's largest negative paper 22 inches by 18. They elicited great admiration.

Major Tytler remarked that he had brought them to the notice of the Society, chiefly with the object of encouraging Photography, in a scientific point of view; such illustrations were of great value in elucidating the researches of the Society.

The cordial thanks of the Meeting were voted to Major and Mrs. Tytler for this very interesting exhibition and a hope was expressed that at the next meeting Major Tytler would oblige the Society by shewing a further selection from his Photographs.

The Officiating Librarian submitted the usual monthly report.

#### LIBRARY.

The Library has received the following accessions during the month of April last.

#### *Presented.*

Quarterly Journal of the Geological Society, No. 57, for February, 1859.

Address delivered at the Anniversary Meeting of the Geological Society of London, by the President of the Society.

Journal of the Statistical Society of London, Vol. XXII. Part I., March, 1859, London.

Journal Asiatique, No. 49, January, 1859, Paris.

London, Edinburgh and Dublin Philosophical Magazine and Journal of Science, No. 113, March, 1859.



Annalen der Chemie und Pharmacie, for December, 1858.

Proceedings of the Royal Geographical Society of London, No. I, 1859, London.

The Athenæum for February, 1859.

The Calcutta Christian Spectator for March, 1859.

Bibidhartha Sangraha for Agrahayun Saka, 1780.

Le Bostan de Saadi, par Garcin de Tassy. Paris, 1859.

Annals of the Indian Administration, Part I. Vol. III. March, 1859.—

BY THE HOME DEPARTMENT.

Manuva Dhurma Prokash, or the Institutes of Menu in Hindui.—By DEVIDYALL.

Selections from the Records of the Bombay Government, No. XLIV. Report of the examination of the Mineral Districts of the Nerbudda Valley.—By J. H. BLACKWELL, Esq.

Quaritch's Catalogue of valuable Books. London, 1859. 2 copies.

*Books purchased.*

Garnett, Rev. Richard, Philological Essays. London, 8vo. 1859.

Annals and Magazine of Natural History, &c. No. XV. March, 1859, London.

Journal des Savants, for February, 1859, Paris.

Grimm, Jacob und Wilhelm, Deutsches Wörterbuch—Dritten Bandes erste Lieferung Leipzig, 1859.

Brockhaus, Hermann, Die Lieder des Hafis, Persisch mit dem Commentare des Sudi, Zweiten Bandes Zweites Heft, Leipzig, 1859.

Comptes Rendus, Tome 48, Nos. 6, 7 and 8. Paris, 1859.

Revue des Deux Mondes, for 15th February and 1st March, 1859, Paris.

Literary Gazette, Nos. 34 to 37 for February, 1859.



# JOURNAL

OF THE

# ASIATIC SOCIETY.

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No. III. 1859.

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*Notes and Queries suggested by a Visit to Orissa in January 1859.—*  
*By the Rev. J. LONG.*

1. *Orissa now and formerly.* Orissa is so cut off from other parts of India through the want of easy and cheap communication that little is known about it,—though whether we consider its famous temple, the stronghold of Hinduism, or its ancient history when Buddhism was in the ascendant,—there is very much to interest the philanthropist and the antiquarian. The paucity of ruins in Orissa is no criterion of its past condition, as for example,—the Nepal Terai, now a deadly jungle, was 3000 years ago the abode of a powerful race, and Janak, Ram's father-in-law, held his Court there;—the Sunderbuns a few centuries ago could boast of a flourishing population and of five cities,—and in Purulia, now an *Ultima Thule*, the ruins of a large city may be found. Though in Orissa there are few monuments of antiquity to throw light on the past yet we can grope in MSS., traditions and customs.

2. *Inference as to its future prospects.* There is a cry raised now that investigations into the past condition of India are of no practical use, and that Indian experience is of no value,—but the fact is overlooked that the past is mother of the future, and that the former social condition of a people has an important bearing on prospective measures for their enlightenment. Antiquarian enquiries in Nepal, Ceylon and China show that Buddhism, so noted in its regard for enlightening the masses and opposing caste,

was for ages predominant all through Orissa both among rulers and people,—though Orissa be *now* the garden of Hinduism and Jagannath its Jerusalem. Even Jagannath itself stands on the site of a Buddhist temple and contained the celebrated tooth of Buddha, which was kept there till the 4th century, A. D., when it was carried for a short period to Patna, the ancient Palibothra, then the capital of North India, it was soon after brought back to Puri, but on an invasion of the country, it was conveyed A. D. 311 by a king's daughter concealed in her hair to Ceylon, which was then becoming a place of refuge to the Buddhists from the Brahmans' rage. Prinsep, Lassen, Burnouf have established from the evidence of MSS., Inscriptions on pillars, rocks, &c., that Buddhism was the state religion of India from the days of Asoka 3 centuries B. C. to the 4th century A. D., while the Chinese travellers Fa Hian and Hiuan Tshang give us information of its prevalence up to the 7th century A. D.

3. *My enquiries in Orissa.* I spent ten days at Puri and subsequently visited Bhubanesar, Kattak, the rock cut caves of Kandigiri, the country on the borders of the Chilka lake; in all those places I sought by procuring Sanskrit or Uriya MSS., by conversation with intelligent pandits, natives and Europeans to ascertain the local traditions and to gain any information which would prove a clue to the past history of Orissa. Sterling's Orissa alas is the only work written by an European that throws light on former days, with the exception of Major Kittoe's account of his visits to the Cave temples at Bhubanesar. Subsequent books indicate that the writers knew little of the people below the surface and are mere plagiarisms from Sterling's work.

4. *Myths are sometimes truths in symbol.* Lassen in his Indische Alterthumskunde has shown that the Epic poems of the Ramayan and Mahabharat, though myths, may yield their quota of geographic and historic truth to the careful investigator. Wilson has made the Vishnu Purana subserve the same object, and we need for India in the present day a Walter Scott who will render old legends, popular songs, and mythic works conducive to the cause of historic research.

5. *MSS. relating to Orissa.* In the following MSS. procurable in Orissa, are scattered data and hints, which may be of value to one

investigating the former social and religious condition of the people of Orissa.

UTKAL KHAND MS. in Sanskrit.

A section of the Skandha Purana, detailing the places of pilgrimage in Orissa from Jagannath to the Vaitariní river and the origin of the worship at Jagannath. It follows the same plan as the *Kási Khand*, which gives similar information regarding Benares.

KHETRA MAHATMEA MS. in Sanskrit.

A part of the Skandha Purana, stating various points about the sanctity of the places at Bhubanesar—the ancient Benares of Orissa before Jagannath rose into popular estimation. I found this MS. held in great esteem by the pandits at Bhubanesar.

KAPILA SANHITÁ MS. in Sanskrit.

A collection from various Puranas, giving the legends relating to Jagannath, Kanárák, Bhubanesar, Jájipur.

ITI HÁS SAMUCHAY MS. in Sanskrit.

An account of Rajas and temples in various parts of India.

MANDALI PANGI MS. in Uriya.

Records of the Jagannath temple, begun in the 13th century, by Churang Deva, the first of the Ganga Vansa line of Rajas. This MS. is referred to in the Courts as an authority to decide disputes among the officers of Jagannath's temple. It gives an account of Kála Páhar the great Moslem iconoclast of Orissa.

GAJAPATI VANSÁBALI MS. in Uriya.

A Genealogical account of the Orissa rajas of the Gajapati line, with the various temple officers at Jagannath.

RÁJ CHARITA MS. in Uriya.

History of the Kings of Orissa of the Kesari race.

KÁNJI KAVIRI PUTHI MS. in Uriya.

An Epic poem celebrating the conquest of Conjeveram.

EKÁMRA MAHATMEA MS. on Bhubanesar.

SIVA PURANA MS. in Sanskrit.

Gives information about Bhubanesar.

JAGANMOHANA MS. in Uriya.

Description of Jagannath and its festivals.

*Use might be made of the MSS. referred to by Wilford such as—*

A BENGALI PANDIT'S COMMENTARY ON THE GEOGRAPHY OF THE MAHABHÁRAT.

VIKRAMA SÁGAR MS.

DESA MÁLÁ AND KHSHETRA SAMÁSA OF THE PURANAS.

BHUVANA KOSA OF THE BHAVISHYEA PURANA.

KRITADHÁRÁVALI MS.

TÁRÁ TANTRA MS.

It is a subject of regret that Lassen in his great work the *Alterthumskunde* had not these MSS.

We want some one to do for Orissa, what Major Troyer in Paris has performed for Kashmir in his *Rājatarangíní*, viz. to give us a translation of the pith of the above MSS. with notes and preliminary dissertations. As the valley of Kashmir, owing to the discovery of a MS. 40 years ago, has afforded so rich a field of investigation into the social and religious condition of its people in days of yore—surely Orissa is not barren of incidents on the same subject?

6. *Life of Sangkar Acharyea of use for Orissa.* In connection with the history of Orissa a life of *Sangkar A'charyea* compiled from such MSS. as the SANGKAR KATHÁ, SANGKAR CHARITRA, KERALUTPATI, SANGKAR BIJAY AND SARVA DARSHANA SANGRAHA is desirable. Light would thus be thrown on the state of Orissa when the dogmas of Sangkar gained the ascendancy over the Vaishnav and Buddhist systems. Though Sangkar himself was so liberal as to be a follower both of the Vedantic and Tantric systems, yet to the Buddhists he was the *malleus hereticorum*, and like Charlemagne he resorted to the sword when the process of conviction was too slow. Professor Wilson in his "Sects of the Hindus" has made much use of these MSS., but he admits that a *further analysis* of them would be of great value in giving the state of Hinduism in the 9th century, A. D. He wrote his account 30 years ago, but since that period immense progress has been made with reference to oriental research in France, Germany, Russia and England.

7. *Chaitanyea.* The effect of Chaitanyea the great Vaishnab's preaching in Orissa in the 16th century would deserve investigation. His doctrines gained rapid ascendancy when Pratáp Rudra

Deva, one of the Gajapati kings who ruled from A. D. 1503 renounced the Jain doctrines and adopted those of Chaitanyea. The following printed books afford some information on the subject.

CHAITANYEA CHANDRODAY, CHAITANYEA BHÁGAVAT, CHAITANYEA CHARITRA.—But there are many MSS. hoarded up by the Gosains as carefully as the Jains hoard up theirs—*these ought to be procured.*

8. *Jain MSS. desirable.* The Jains have very valuable libraries in Rajputana which, judging from what China has yielded, may also remove some of the veil which hangs over Orissa. I was two years ago in a Jain house in Benares where there was a large collection of Jain MSS. Dr. Stevenson has made use of Jain MSS. to give information regarding certain places in the Bombay Presidency. These MSS. might afford a clue to the connection of the Jains or Buddhists in Central India with those in Orissa. A Buddhist inscription has been found in a Buddhist temple in Nagpur of the date 657 A. D., and it was not until the 13th century the Jains were expelled from the Pandyan country.

Analyses of these works with notes on the plan that Hodgson and Ksoma de Koros have adopted, would be of great use. The Asiatic Society might publish some in their *Bibliotheca Indica*, which hitherto has contained few works throwing light on the *social condition and manners of the people of India.*

9. *Romanising in Orissa.* All the Sanskrit MS. used in Orissa are written in the Uriya and not in the Nagari character, though the latter is the *sacred character* of India and hence called the *Deva Nagari* or divine character, but the *Brahmans* will not accept an universal character—nationality prevails over theory—and yet there are men who dream of abolishing all the Indian alphabets and substituting the English alphabet for them!

10. *Uriya language.* The Uriya language has been very little cultivated: the Brahman scholars in Orissa as well as in Bengal despised the Vernacular. The Bhagavat Gita however was translated from the Sanskrit into Uriya three centuries ago; among original works are the *Rasa Kalol* on Krishna, the *Vaidehivilás* about Ram, the *Labaneatatva*, a tale, the *Mukunda Málá*, *Járatí bhakti* a

Vaishnav work, *Rasamanjari* and *Rasapanchak* with several *Mahátmeas* or temple legends.

11. *Fractions of Languages.* Valuable as is the Uriya language for imparting to the common people an *elementary* education, it is not likely to be much cultivated: the people of Orissa are too few to render it probable that the expenses of creating a literature can be borne by them or by Government, it will be much easier for Uriyas who wish to acquire knowledge to gain it through the Bengali, a kindred language, which is rapidly developing itself. The Bengali is already rapidly encroaching on the Uriya. The cultivation of the smaller dialects or “fractions of languages” in India promotes division and isolation, even natives when left to themselves prefer the cultivation of a more refined Indian language—thus in the Southal districts Hindi is being studied, as also in Chota Nagpur, while among the Karens of Burma the Burmese language must be ultimately the vehicle for communicating to them literature and science. Both in Assam and Orissa Government teaches Bengali to the highest classes in the schools.

12. *Pali elements in Uriya.* When the Buddhists held sway in Orissa, Pali was probably in use, it would be interesting to trace out what Pali elements are in the Uriya language and also if there be any Telegu elements, as Caldwell in his “Dravidian languages” states that “Telegu was formerly spoken as far north as the mouths of the Ganges.” We very much need a Comparative Grammar of the Bengali, Hindi, Mahratta and Uriya languages, pointing out their Scythian, Sanskrit and Pali elements and their various dialectical changes.

13. *Orissa and Bengal little connected.* Orissa seems in very early times to have had little direct connection with Bengal. Though Adisur sent Brahmans from Kanauj to Bengal, because probably of the influence of Buddhism there, the Pal kings of Gaur being Buddhists—and Sakhya Muni the last great prophet of Buddhism had died in Assam, there is no mention of Orissa in connection with them. Even now there is not a single Bengali Mahant at Jagannath, though there are about 120 of that class, some of whom realise half a lac a year income. Hence customs differ much in Bengal and Orissa, the following prevail or prevailed in Orissa as distinct from Bengal.



14. *Peculiar Customs in Orissa.* If a brother dies childless his brother is to marry the widow in order to raise up seed to the deceased—in satis women were burned in a pit—the Brahmans eat no fish—the impurity of a Sudra after the death of a relative lasts only 10 days, in Bengal 30 days.—Marriages take place at a riper age.—Barbers and cultivators eat in the houses of the bearer caste—there are no Brahmini bulls revered—at shrads only pinda or vegetables are offered.—Raghu Nandan's smritis have no authority—women are kept more secluded.—Brahmans eat onions, wear no shoes,—the women tattoo their forehead and arms,—many Sudras know a little Sanskrit,—the Brahmans study the Yajur Veda, in Bengal the Sama Veda. It would be interesting to enquire into the special causes of the diversity of some of these customs.

15. *Was Hinduism introduced into Orissa in the days of Ram Chandra?*

The Ramayan mentions Ram's sojourn during part of his exile in the Dandaka forest and near the Godavery, places to the South West of Orissa; while tradition connects the rocks of Khandigiri with Hanuman and states that Kapila Muni resided in their neighbourhood. The 4th section of the Raghu Vansa gives the march of one of the Hindu armies of Ram's period to the borders of the Bay of Bengal which must have been near the coast of Orissa. A king of Kashmir Lalitádyea is stated in the *Rájtarangini* to have marched an army about Ram's era to the South of India. The progress of the Arian race having been a gradual one South, Kashmir, Hastinapur, Oude, Benares, Palibothra, Gaur, becoming successive centres, a place like Orissa could hardly have been overlooked as affording facilities for embarking by sea to the South. In Manu's time Brahmans were sea-captains and traded with foreign countries, while the chief seats of religious worship having been on promontories of the sea such as Somnath and Dwarka in Scinde, Ramiseran and Mavalipur in South India, Sagur Island in Bengal, Jagannath and Kanarak in Orissa, would show that the ocean was used in early times for pilgrimage and religious propagandism.

16. *When was Buddhism introduced into Orissa?* Probably in the days of king Asoka about 250 B. C. as appears from the Dhauli inscription—he sent Buddhist missionaries in all directions to the

slopes of the Himmalayas, and the banks of the Indus, as well as his own brother as a Buddhist missionary to Ceylon; subsequently a close religious intercourse between Ceylon and Palibothra, (Patna) was maintained by sea. We have in Fa Hian's travels (3rd century A. D.) an account of vessels sailing between Tamluk to the North of Orissa and China, while Buddhist remains are found on the Madras coast at the Kistna and Mahavellepuram. Want of roads were no obstacle to Buddhist itinerants as the Rājtarangini states of them.

*Bandvanām prabajyorjit tejasan.*

Orissa would form a central point for pilgrims travelling between Bahar, the fount of Indian Buddhism and Ceylon, pilgrims landing from Ceylon at Jagannath would see Buddha's tooth there, then proceed to Bhubaneswar the Buddhist Benares of that day, thence to Vishnupur a mighty place at that period, and so on to Paras-nath, or they might have proceeded to Tamluk or Tamralipti\* and have gone up the Ganges.

17. *Orissa nationality.* While in Bengal we have never had any traces of independence and nationality, in Orissa it is different. The Orissa rulers three centuries ago extended their sway as far North as Tribeni on the Hughly, the Southern Prayág of the Hindus, and as far South as the Godaveri, while the Orissa Rájá opposed in battle the mighty Krishna Roy, king of Vijayanagar.† The Orissa peasants are an honester and braver race than the Bengali, happily for them they are not ground down by zemindars as the Bengal peasants are under the permanent settlement, the ze-

\* Tamluk is described by Huian Tshang in the 7th century as a place where great traffic was carried on by land and by water. In the 3rd century Fa Hian found 1000 monks there and a tower erected by Asoka, while before the Christian era, according to Klaproth, Dharmasokar, king of all Jambudpi, sent an Embassy to Ceylon which embarked at Tamluk.

† We have an analogous instance of the power of nations bordering on Bengal in the case of the Asamese who in the days of Aurangjib destroyed the army sent under Mir Jumla to conquer their country. The Tripura men have been noted for their bravery and even the women rushed to the battle field and some of them, as the Tripura MSS. show, like the Mahrattas led armies.

mindar cannot oust them at will. There is a report of Mr. Forster's on this subject which well deserves reprinting.

18. *Hill people of Orissa.* The hill population of Orissa is very different from that of the plains, they belong to the aboriginal tribes but little is known of their original languages and traditions. Their Rájás were the Rob Roys of their districts, the oldest family is that of the Rája of Kurdah. Six centuries ago they came from the North West of India. It would be worth enquiry *what Scythian or Celtic remains are to be found in those hills*, any structures in the form of cairns, cromlechs, burrows. Dr. Wise in his paper in the Transactions of the Royal Society of Edinburgh, Vol. XXI. Pt. II. p. 255 shews the general identity in idea and design of the Celtic structures of Europe and the Buddhist relics of India; Professor Westergaard has written on a similar subject with regard to Iceland.

19. *Jagannath temple, origin of its peculiarities.* The interior of the temple of Jagannath cannot be seen by Europeans, I have found the natives of Orissa more jealous about allowing Europeans into their temples than the natives of Benares,—is it that never having felt much of the rough hand of the Moslem dealing unscrupulously with their prejudices, they have therefore become so exclusive? The interior of the temple is said to be a regular pantheon having temples to Hanuman, Vibhishan, Suryea, Indra, Nanda, Kuvera, Sitala.\* There are various points besides this in connection with Jagannath, which seem to indicate that it was an eclectic system selecting from different sects and incorporating all; thus though Jagannath gives much ascendancy to the Vaishnavs, yet the Pandahs at Jagannath all belong to the Shákta sect of the Sivites, they do not, however, practice those horribly obscene rites

\* It would be worth enquiry as to when the worship of Sitala, the goddess of the small-pox, arose. Dr. Wise of Dacca collected much information on this subject which he has taken to Europe with him. Near Calcutta there is a temple to the goddess of cholera erected forty years ago, when this epidemic arose in India. It would be interesting to know also when the worship of the *grám devatá* or village gods arose in Bengal, the bráhmans do not admit their pedigree; to the South of Calcutta a god called Dakhin Roy is worshipped as the protector of the ryots against floods and tigers. Is this a god of the old aborigines of Bengal?

observed by the same sect at Santipore. It seems also to retain some traces of the old Buddhistic system, thus the Rath Jātrā procession is said to have been derived from the Buddhist procession with the birth of Jagannāth, there is no procession like this connected with other gods of Hinduism. The practice also peculiar to Jagannath of all, excepting the lowest classes, eating together, seems a remnant of that Buddhistic principle which had for its system of action long before the French Revolution, "liberté, égalité, fraternité." The architecture of the car of Jagannath is like that of certain Buddhist religious buildings, the temple of Jagannath similar to the Gaya temple corresponds in its architectural shape with that of the Buddhist temple at Patan in Nepal, the bráhmans call the temple of Maha Buddha or Gaya, Jagannath. The bráhmans found the easiest way to obliterate the remembrance of Buddhist idols was to adopt them and give them bráhminical names.

20. *Bhubaneswar and its ruins.* Next to Jagannath the place of greatest interest in Orissa is the city of Bhubanesar, the approach to it is most striking. The traveller emerges all at once from paddy-fields into the midst of a deserted city, another Palmyra, ruins of temples all around, but no worshippers, reminding one strongly of the ruins of Toglokabad near Delhi or of Sarnath the old site of Buddhist Benares. When Bhubanesar with its 999 Siva temples was founded, Buddhism was waning from Orissa and the Sivite system was gaining the ascendancy, not merely owing to persecution but also to a reaction from the strict and ascetic system of Buddhism, like what took place in England from the prudery under Cromwell to the licentious days of Charles the 2nd. Buddhism itself was altering too, and after introducing a system of hero-worship, its followers ended in the worship of female deities, and finally many adopted a system half Sivite, half Buddhist. What a contrast between the worship of the original Buddhists in Orissa and the later period when they adopted the Tantrik system. The existence of this system in Nepal among the Buddhists was discovered with great difficulty by Hodgson, and as it spread to Thibet in the 11th century and was powerful in India according to Ksoma de Koros in the 9th century, its origin was probably coeval with the erection of the Sivite temples at Bhubanesar.

21. *Was Bhubanesar originally Buddhist?* It is singular that no civil buildings remain in Bhubanesar with the exception of some ruins pointed out as the site of the palace of the Kesari rajas, who are said to have founded Bhubanesar A. D. 620, and to have made it the seat of their government. *Is it not probable that the existing Sivite temples were made out of Buddhist ones?* In Europe at the Reformation, Roman Catholic Churches were turned to Protestant uses. The Brahmans of India adopted the same plan with the buildings of their Buddhist rivals, the Musalmans did the same with Jain buildings. *Is it not probable there was a Buddhist Bhubanesar?* It lay on the high road from Puri to Magadh, and as at Delhi the ground has been the site of three distinct capitals of three different dynasties, so why may Bhubanesar not have been Hindu and Buddhist at successive periods?

22. *Rock-cut Caves of Khandigiri.* Six miles from Bhubanesar are the Buddhist CAVES OF KHANDIGIRI among the oldest in India, executed probably about two centuries B. C., half a century after Buddhism gained a footing in Orissa. The caves of Ajunta were not excavated till about A. D. 1100, and yet it is singular that nine-tenths of the fifty different groups of Buddhist caves in India should be in the Bombay Presidency, so far away from Magadh the seat of Indian Buddhism. The Khandigiri caves are adapted either for solitary ascetics or for monks living in community. Why is the verandah of one of them carved into a form to represent the tiger's head? The Pali inscriptions over some of the caves which have stood the storms and changes of twenty centuries, afford a strong contrast with the ephemeral paper memorials of the Mah-rattas and Moslems in Orissa. Jain merchants who occasionally come on pilgrimage here have erected a Jain temple on the top of one of those cave hills, behind the temple they heap up memorial stones like the cairns of the Celts. No buildings are near those caves, the Buddhists always preferring their fraternities to be located away from the din and noise of cities.

23. *Kanarak temple.* As a monumental link between the old Vedic worship and Buddhism we have the temple of the Sun or KANARAK,—there is another temple to the Sun at Ajmir—landmarks on the sand of time to show the passing away of false sys-

tems—it is singular that in Orissa, whatever the deity be that the temple is dedicated to, the figures of the nine planets occupy a position over the doorway. At the time when this temple was erected—about the 12th century,—the worship of the Sun was still recognised, the Sauras or Sun worshippers are frequently mentioned in the life of Sangkara Acharya about the 10th century. The *agni-hotra* or sacrifice to fire was performed in Bengal at the close of last century by Rajakrishna Ray of Nuddea; he is said to have been the last person in Bengal who kept a fire perpetually burning, the relics of a worship once common to the highlands of Persia and the plains of India. This temple of the Sun now presents a complete image of desolation, tens of thousands of bats occupy the interior of the temple and a bear has taken up its abode amid the ruins, while around is a waste of sand relieved occasionally by a beautiful convolvulus or the spike grass which vegetates so easily in the sand.

The temple, however, in its obscene sculpture, shews what influence the Tantrik system had at that time gained in Orissa. It was the time when Sivism had won its ascendancy by fire and sword; the temple of Jagannath dates from this same period as do all the great Sivite temples in South India. How was it the sculpture of this temple escaped the iconoclast hand of Kálá Páhar? A stone which formerly topped the doorway is 20 feet long by  $4\frac{1}{4}$  square, its weight is 10 tons, the nine planets are beautifully sculptured on it, near it lies a bar of iron 20 feet long by 10 inches square weighing  $1\frac{1}{2}$  tons, close to it are three figures in stone of lions rampant on the elephant  $6\frac{1}{2}$  feet high by 6 feet long.\* The immense size of the stones and beauty of the sculpture shew that the mechanical arts were in a forward state eight centuries ago. Those enormous stones were brought from

\* At the time of James Prinsep, the Asiatic Society applied to the Government for permission to remove some of the sculptures to the Asiatic Society's Museum. No answer was sent, but the present Commissioner G. Cockburn, Esq. is quite willing to grant it. Time and the influence of vegetation are rapidly undermining a temple. A Surveyor lately proposed the stones should be used up for surveying purposes. A few years ago the Raja of Khurda through mercenary motives destroyed some of the finest parts of the temple.

the Kattak hills, but how were they carried over the sand? Is it not very probable that the sea formerly flowed up to the base of the temple? In Orissa the land has been gaining on the sea all along the coast, and so has the sand; in Puri there are many buildings now buried under the sand, which in the memory of living men were known to have been built above them. The same process which is increasing the Sandheads and filling up the Hooghly river is going on in Orissa. The deposits brought down by the hill streams and large rivers of Orissa must be gradually silting up the coasts.

24. *Cuttack—ancient city of Orissa.* The foundation of CUTTACK is attributed to the 10th century,—is not this the modern city however? Was not ancient Cuttack situated to the North, at a distance from the treacherous Mahanadi river,—immense ruins have been found there, which served to build the Fort of Cuttack and to form the revetment. Probably old Cuttack was the political and commercial capital of Orissa, for which its position at the head of the Delta and on the road to Magadh or Bahar favoured it. Cuttack had until lately a fine monument of antiquity Fort Bárabati, a splendid specimen of an old fortification which contained remains of the Kesari Raja of the 14th century.\* Though Kattak was the capital of the Mahrattas in Orissa, there are no documents available in Orissa to throw light on their career: like the Musalmans in Orissa they seem to have intermeddled very little in internal arrangements of the country, they were men of the sword not of the pen. The Patans, however, have gained such a hold in Orissa that one-tenth of the population is Afghan.

### *Queries.*

I append a few additional queries or desideranda relating to other points about Orissa.

\* In 1837 by the Magistrate's orders the fort was pulled down and sold to supply metalling for the roads. An ignorant or perverted taste would lead some men to obliterate all recollections of the past. They see not the force of Dr. Johnson's maxim, "Whatever makes the past, the distant, or the future predominate over the present, raises us in the scale of being."

(1) The having the hills explored by a Botanist, who would also ascertain the Uriya names of all plants in Orissa with their signification and their use in medicine.

(2) Information about Orissa in the last century or the century previous as contained in Portuguese, French or Dutch works. Extensive trade was carried on with Balasore by European traders.\* The Portuguese wrote much about India and an examination of the Libraries of Portugal would throw much light on many Indian subjects. The Dutch also have published various works, Liudschoncken's Travels deserve examination.

(3) The etymology of the names for Orissa *Utkal* and *Ordesch*?

(4) There are more than 60 *Deva Dási* or temple girls connected with the temple of Jagannath,—when did they first form part of the temple establishment and what is the extent of this practice in other parts of India?

(5) Why should the Buddhist system in Orissa have merged into the Siva system instead of into the Vaishnab, the latter being a much more congenial one?

\* We saw in the Balasore burial ground a tomb, with this inscription, "Here lies the body of Avon, late wife of Capt. Francis William who died 1684."



*Memorandum on the nature and effects of the Flooding of the Indus on 10th August, 1858, as ascertained at Attok and its neighbourhood.—By Capt. W. HENDERSON, Engineers.*

*On the Indus, 7th January, 1859.*

I begin by observing that this is not the first flood of the sort, but that one on a somewhat larger scale, but in other respects very similar, took place in May,\* 1841. I have seen two very brief accounts of this flood, one I think collated by Col. Abbott, the other furnished by Col. Cunningham. I have also collected at Attok and the neighbourhood some information on the effects of this earlier flood; and as the two are very similar and mutually throw light upon one another, I shall have to refer to that of 1841, and so premise this allusion to it.

The first point on which information is called for is the spot where the obstruction took place. This can only be ascertained by sending up an Officer by way of Cashmere. In the meantime I may offer a few observations.

The obstruction of 1841, took place in the upper part of the valley of the Shayok River or northern Indus which joins what is considered as the main Indus at Keris, and I think brings down more water than the other, which from its long and straight course is naturally considered the principal or parent stream. The blocking took place in the part of the Valley where the stream runs at the back of a high range which separates it from the Nubra Valley. I have been over this ground and was struck with the frequency and solidity of the glaciers which occupy almost every valley in the range, with their tributary glens also. The range is granite, and large rough blocks of that rock form an important component of these glaciers.

The first information was received in the neighbourhood of Attok about the middle of July 1858, and of all that I have heard of, that which appeared most worthy of credit was a letter forwarding what purported to be a general warning by the Syuds of Kangra or

\* I have no books to refer to, so that the date is assigned on native evidence, which is particularly uncertain as regards time.

Kangri. The Attok boatmen declared at once that the warning received in 1841, emanated from the same place; they recognized the style and stated that the same form of adjuration was employed, and that the signatures appended were the same, except that two or three individuals, who might fairly be supposed to have died in the interval, were omitted from the later document. Search was then made in the house of Bulloo, the oldest of the Mullicks of the boatmen, but though it was well known that the paper was preserved there till a year or two ago, the search proved unsuccessful.

There is a village named Kangri marked in the Surveyor General's map of the Punjab and adjoining countries, and I believe this is the place alluded to, it is at no great distance from the Nubra and Shayok Valleys, and if the fact be that both papers issued from it, a fair inference is that in both cases the obstruction was at no great distance from its site; for in these valleys such news would not travel far except it were down the course of the river. We know that the damming of 1841, took place within two or three days' march of the village, and, till better evidence be obtained, can but conjecture that this also occurred in the Shayok or in the Nubra valley. Both are well adapted for the purpose, being wide with strangulations at intervals, having comparatively a small slope of bed and being supplied from large glaciers above with considerable and unfailing streams of water. For though the main fall of the Indus-bed takes place between Kangri and Attok, yet the general character of all the streams I have observed in the Himalayas is to fall in steps, a comparatively sluggish portion intervening below the first rush of the minor tributaries, to be succeeded by the main stream making its way in a series of rapids for two or three hundred miles. Both the Nubra and the upper Shayok are thus comparatively slow flowing, and in the former especially there are numerous quicksands.

I have two or three times crossed the Shayok, and found it in the summer time a stream of considerable size.

On the other hand, and contradictory to the above, all Major Becher's information pointed to the river of Gilgit, and that pretty consistently; but as this cannot be reconciled to the facts I have noted, as I understand them, I am inclined, till more evidence is obtained, to discredit it. I do not find in the map alluded to glaciers

marked so far west as the River of Gilgit\* nor are the mountains from which it comes so high or so snow-clad as those to the eastward. Indeed I do not know in any part of the Himalayas a region so likely to give birth to catastrophes of the kind as that around the upper part of the Shayok.

The solution of the point is, however, very easy. The whole Indus above the Gilgit river is open to travellers proceeding under the protection of the Maharaja of Cashmere, and any officer starting from that valley and striking the Indus at the foot of the Nunga Purbut, (a route which I recollect an officer of the artillery following in the summer of 1855,) and thence marching upwards, would very soon ascertain positively the exact locality of the obstruction. I should be glad if opportunity offered to proceed thither for the purpose, and regret that when in that country before, I gave less attention to the matter than I should have done had I thought that a flood like that of 1841, could by any chance occur again in any definite number of years.

The second point mooted is the nature of the obstacle. We may pronounce with almost certainty that this was the sudden irruption into a comparatively narrow valley of an immense fragment of a glacier. I have already alluded to the glaciers of the region where I suppose the obstruction to have taken place. I have never seen those of Switzerland, but from what I have heard of them I think that the ones now referred to differ from the character ordinarily assigned to those in Europe, as they certainly greatly excel the latter in magnitude. Yet even in Europe a catastrophe similar to those which have taken place in the Indus valley occurred in that of the Drance in 1818. When crossing from the Nubra to the Shayok valley in August 1855, my companion, who had been in Switzerland, would at first hardly admit that the enormous mass of earth, rock and ice commingled and agglomerated together, with a broad stream of the dirtiest brown water issuing from its foot, and which I pointed out, filling up a tributary valley on our left, was really a glacier; and several hundred miles farther south crossing the great shed between the Lanskar and the Chenab, he pointed out the features he had been accustomed to see, and which we generally find

\* There are however glaciers in every direction and some remarkable ones. Eds.

in description, clear ice of various tints of green, and deep crevasses crossed by snow bridges, and with comparatively clean water running within them. The formation in this case was lime-stone, in the former case granite. With regard to the magnitude of these glaciers I need only say that I travelled nearly a whole day along one which was upwards of fourteen miles in length, varying in width from half a mile to two miles, and several hundred feet in depth.

The glaciers are, it is well known, in constant motion; their progress being subject to the same laws which regulate the motion of rivers. As they advance, their ends melt away and the Moraine gets washed down by the streams that issue from the body of the glaciers. The flow of one glacier measured by Prof. Forbes showed an onward movement of about 450 feet per annum, and it is evident, that where a glacier is cut off above the melting point by a stream running past its end, this motion must make it tend very considerably to encroach into the valley of the stream.

A landslip in one of those huge banks is quite a conceivable contingency, and in no case more likely than when the glacier protrudes with a narrow base and extended top from a small feeding glen coming in, nearly at right angles, into a narrow valley, whose stream crosses the path of the glacier, washing away the narrow foot which the mass behind protrudes, and on which it rests. This foundation being once undermined, the falling forward of a piece of the glacier is the result to be expected; and it is possible that this result often takes place, but that it is not often that circumstances so combine as that the process is delayed till a mass of formidable dimensions topples over.

The remarkable opacity of the water of the Shayok, caused by the glaciers I have described, struck the Messrs. Schlagintweit when carrying on their observations in the neighbourhood, and by adopting a simple test of comparison, they satisfied themselves that in this character it exceeded the water of any stream which they had encountered.

The third point is the "length of time the obstacle remained." On this head the only information to be obtained is native, and that is always vague with regard to matters of time. The warning that came down the river purported to bear date the 2nd July, but

it appears more likely that this date was subsequently inserted in the copy, because it would not allow time for the paper to have travelled down, it having been handed to the Assistant Commissioner Lieut. Shortt, at Shumsabad near Attok, in the middle of the month.

The paper stated that the river had been closed for three months, which would make the beginning of April, and, as the outburst took place apparently on the 8th August, would give for the whole duration a little over four months. But I do not think it likely that so long an interval elapsed—

1st.—Because the period is almost certain to have been exaggerated.

2nd.—Because the thawing powers of the May sun which make that month so peculiarly dangerous from the frequency of avalanches, is likely to have caused the slip.

3rd.—Because from the latter end of May to August those snow-streams are so large that a four months' supply, including that period in the four months, could hardly be supposed to remain stored.

4th.—Because a rather shorter period is assigned, and at a less favorable time of the year, from February to May, for the storage of 1841, which contained apparently about twice the quantity of water, while it is from previous considerations unlikely that any material difference existed between the sites of the two obstructions.

I am inclined to think that the stoppage took place about the middle of May, that it existed for a month before information was sent down below, as till that interval it would hardly be considered a really serious matter; the paper must then have taken about a month to reach Attok, which it did in the middle of July, and after that a delay of nearly another month occurred before the water appeared. The time could not be much shorter than that, though it may have been longer.

The fourth point referred to is the length of time during which a diminution of the stream was perceived below. On this point, I can state that though after the warning rumour came to be pretty generally discussed, people fancied that the stream was peculiarly low, and that it lent corroboration to the report, nothing occurred which would have excited much attention but for the alarm in the country around, and Major Becher assigned as a reason for

regarding the warning with suspicion, that there was nothing unusual to be observed in the conduct of the river.

But the truth is, that there is no reason to think that any of the tributaries, at the point where glaciers abound, is of importance sufficient to affect perceptibly the Indus at Attok; nor indeed is it conceivable that any stream, by the subtradduction of which the Indus could be sensibly diminished, could be dammed up for three months (and I have shewn that the time could not be much shorter); while it is certain that if this were possible, its occurrence would cause a flood far more extensive than that of the 10th August last.

The occurrence of a few cloudy days diminishing the snow melting, or of showery weather in the Hills, cooling the atmosphere there, produces changes in the river, when alternating with bright weather, far more than sufficient to disguise the cutting off of half a dozen of the rivulets which feed the upper waters of the Indus. The river rose last year rather early, compelling me to remove the usual boat-bridge a full month sooner than in 1857, while it afterwards continued for a considerable time at a moderately high level, fluctuating, but not making much progress. We were thus able to establish the bridge in another site, where it continued till 1st June. But all that can be gathered from this is, that along the upper Indus the spring of 1858 was warmer than that of the previous year, but that the genial April was succeeded by cold and cloudy weather. It is indeed a matter of tradition that in 1841 the river became very low previous to the flood, so much so, that men used to cross it by fording above Attok, and when I was collecting information on the subject, they told me that when the bridge of boats was up in February, the river fell in one night several feet, so much in fact that they had to remove boats from either side. I have considerable doubts as to the correctness of either story; and, presuming them both to be amplified from a real paucity of water, have still no reason to think that they had anything to do with the fact of one of the feeders of the river being dammed up some six hundred miles off; besides that, as I before hinted, the period of storage from February to May appears too short. It was also a prominent part of the tradition that the water was much warmer than usual;

as if the snow-supply had been cut off. This I think as improbable as the other circumstances narrated; and to illustrate the probability of their being exaggerated into falsity, I may mention the facts with regard to another phenomenon universally insisted on.—All accounts of the flood of 1841 particularize the wave or wall which swept down the channel of the river, and the noise occasioned by it, which was the first harbinger of the approaching destruction. Some of my informants gravely talked of this wave as 50 or 60 feet high, and of the roar being heard while the water was still a considerable distance behind. In Col. Abbott's notes on the matter, these points are prominent, and it is added that in front of the great wave was a moving mass of carcases, trees, and other matter, swept on by the power of the water.

On this last occasion I was myself on the river in a row boat, which a wave one foot high would doubtless have swamped, but wave there was none, nor noise either, nor any appearance of carcases or anything of the kind. The river commenced rising quickly, but step by step, nor until it had attained a considerable height was there any sign of drift-wood, field-produce, or other floating material.

I made fresh enquiries into the circumstances observed on the previous occasion, and then discovered that there was living till 1857 an old boatman called Lutchoo, who it was well known to all the men had been sitting on his boat in the middle of the bridge at the time the flood occurred, and had managed to float away upon it and ultimately to come safe to land in the mouth of the Herrot. I do not deny that this was a very remarkable escape, nor do I doubt that one dam might give way in a more gradual mode than another, but I feel convinced that a three feet wave would have swamped every one of the old Attok boats, and looking to the ordinary action of running water, am certainly inclined to believe that the flood came down in 1841 much as it did in 1858; and that the wave, the roaring, and the mass of dead bodies, are all fictions together, and in the same way I think that the diminution of water in 1841 has been invented or exaggerated, and that if any such took place it was not owing to the obstruction at all; for on the one hand the stoppage of the main stream of the Indus, at any point where it

deserves such a name, is too wild a supposition to be seriously advanced, and is not the least borne out by the extent and nature of the flood; while, as insisted, the feeders which run through the tract where glaciers are common are too insignificant to affect the Indus at Attok.

The fifth and sixth points enumerated, the height to which the waters rose at the obstruction, and the distance to which the stream was dammed back, are of course far beyond our ken, when the very location of the obstruction itself is indeterminate to a distance of about 300 miles, nor can they be ascertained in any other way than by actual inspection; for though a very rough approximation might be made to the quantity of water discharged, the high valleys vary so much in breadth and in longitudinal slope that the question would still remain undecided; early inspection will settle the point, and that alone will.

The velocity with which the flood water came down was very different at different points of the course, being in the general greatest at the first, and diminishing as the slope of the bed decreased. From Attok to Kallabagh the velocity was fifteen miles per hour, the fall of the bed being about two and a half feet per mile; and this leads me to note that the velocity of the prior flood appears to me to have been under-estimated in an account I have seen (prepared I think by Colonel Cunningham). It is there stated that the flood water passed a village on the upper Shayok valley at 2 P. M. and that it reached Torbela at the same hour just two days after. From this a velocity of between eleven and twelve miles is deduced.

I should rather be disposed to think that only one day elapsed, and that the velocity attained to nearly twenty-three miles per hour, but for one consideration, which is this. The water certainly reached Attok a little before sunset, say about 6 P. M. and from Attok to Torbela is forty miles. This would give therefore, if the hour at Torbela be correct, a velocity of but ten miles per hour. I should expect, from the river here debouching out of the hills upon the Chuch plain, a great diminution of velocity between Torbela and Attok, (to be to some extent recovered below Attok), but not such a falling off as this; and therefore I think it probable that the time at



Torbela was somewhat later than 2 P. M. on the day after that on which the dam gave way, giving a velocity of about twenty-one and a half miles per hour to Torbela, and of thirteen thence to Attok. But, however, that may be, as I was at Attok on the 10th and at Kallabagh on the 12th, as I made enquiries on the way down, and at Maree, opposite Kallabagh, found an European Patrol Officer who could speak with certainty on the point, the rate I have given above may be accepted as an accurately observed one for the portion of the river I have particularized. The highest velocity I have obtained in the annual floods at Attok is thirteen miles per hour, and judging from what I know of times of transit, I should estimate the highest ordinary velocity between Attok and Kallabagh at eleven miles for the whole way. With regard to the velocity on this occasion above Attok I can only offer the following,—presuming the obstacle to have taken place as on the former occasion in the vicinity of the Nubra valley, we cannot assume the place at less than 9000 feet above the sea-level, or say 8000 above the Indus at Attok. Taking the extreme distance at six hundred miles we have a mean fall of  $13\frac{1}{3}$  feet per mile to set against the  $21\frac{1}{2}$  feet per mile from Attok to Kallabagh, while we know that as far as Torbela the river runs in a comparatively confined rocky channel and at all times with considerable velocity. It seems probable then that up to Torbela the velocity with which the first flood water travelled, considerably exceeded 15 miles per hour, that from Torbela to Attok it did not attain this velocity, but that it did from Attok to Kallabagh, below which place again it fanned out more leisurely, until 150 miles below the effects were hardly to be discerned and the time of first arrival cannot be ascertained. The flood water reached Attok at 6 A. M., and the rise was at its maximum about 1.30 P. M.; the total height attained above cold weather level was 80 feet, while the earlier flood, I estimate from all the information and circumstantial evidence which I have been able to procure, culminated at 12 feet higher. The annual flooding in July and August reaches about 50 feet; in 1856 it was a little over that; in 1851 it was almost exactly 50 feet; while in the other years I have observed it, it has fallen a little short of that height; so that this flood may be taken at Attok to have been 30 feet over the ordinary flood

level. At the time the occurrence took place the river was about half level, so that the rise which ensued in  $7\frac{1}{2}$  hours was 55 feet nearly. This rise was of course greatest at first, and during the last hour or two very gradual. About 10 o'clock the rapid increase ceased, and when I then crossed the river (not without danger) it was about 6 or 7 feet lower than the maximum height which it attained. This would give for the 4 hours a perpendicular rise, on the mean, of 12 feet per hour. I was close to the bank during the whole time, and though more intent on saving the boats &c. than on watching the progress of the water, can give an approximate conjecture as to the rate at which the river increased. During the first hour it rose about 26 feet, second 12 feet, third 7 feet, fourth 4 feet. At first it came welling up quite quietly, but very rapidly, not less for a little time than a foot per minute. This of course did not last very long, for as the width, the depth and the velocity increased, so did the discharge, and while the rise was very obvious till about 10 A. M. it then ceased to strike a transient observer. The width meanwhile at the narrowest part at Attok was a little over 1500 feet, the breadth before the flood came down having been about 800. I have not had an opportunity of ascertaining what the rise was at Torbela and above it, but it must have been in the general greater than at Attok; that is, in places with the bed as narrow, and the banks as steep and immoveable, and with the egress as confined, a greater rise will have taken place; for below Torbela lies the Chuch plain, sloping in comparison gently to the river. Over this ground the flood-water widely extended, and gradually returned, while the general direction of the Indus and of the Cabul river a little above their junction is almost directly antagonistic, and the Indus flood, keeping in a great measure its course, rolled over the stream of the Cabul river and filled up its channel and the adjacent low ground to a length of about 30 miles, with an average breadth of more than 2 miles, and a depth at base of 60 feet above the original level of the stream. This large safety-valve exhausted much of the destructive effects which would otherwise have been felt below; though the country was probably a loser rather than a gainer by the exchange; for the valley of the Cabul river is low, well cultivated and thickly populated in comparison to any tracts I know near the bed of the Indus.

Below Attok we find a comparative diminution of violence, though between Neelab and Shadeepore where the river finds a passage through the limestone range of the Neelabgosha the channel being in general narrower, abounding too in sharp turns where dead walls of rock oppose a bar to a free run, and throughout being closed in by steep limestone cliffs, the height attained by the flood is in parts even greater than that recorded at Attok. Leaving the limestone for sandstone, the channel widens out and becomes less abruptly tortuous, so that between Shadeepore and Mokkadd, the maximum rise is much less than above; still more is this the case through the gravel hills which dip even less steeply into the channel, and which have at foot been worn more to the requirements of the river.

Here the rise reached only 10 or 12 feet over the annual flood mark.

The hills of the salt range, through which the river runs just above Kallabagh, did not cause such an additional rise as might have been expected; for the passage through is short and below all is open. The height as measured at Mr. Mathew's house at Marree gave only 8 feet above flood-level. The annual rise here which at Attok is 50 feet reaches only 16 or 17 feet over cold weather mark. Below Kallabagh the river fans out very remarkably, with however a strong set upon the right bank. Here the rise was very small indeed. The annual flooding at this part attains no great height, and is principally striking by its vast expanse. Damage resulted below Kallabagh, but not by submergence, it was the effect of the set of the current alluded to.

Farther down, the effects are marked not by inundation and destruction but by the after-result, a comparative subsidence which covered all the islands and flats along the right bank of the river with the spoils of the regions above. The extensive mud-banks and reed-jungles in the vicinity of Esankheyl were particularly rich in this deposit; and between Kallabagh and this place we were fortunate enough to recover 17 out of 20 of the large boats (about 30 tons measurement) which had been carried away from their moorings below Attok. A little below Esankheyl where the Koorrym river falls into the Indus, we got the last of the

boats, and observed the harvest of drift wood, so abundant above, *tail* away and disappear. Beyond this only a few straggling pieces made their way. A slight rise, but insufficient to suggest anything beyond the usual rains of the season, was observed between Esankheyl and Dera Ismail Khan; below that, nothing was noticed unusual. The swelling of 1856 which at Attok we know did not attain by  $28\frac{1}{2}$  feet the rise of the 10th August last, seriously injured Leia, and almost washed Dera Gazee Khan away, breaching an embankment which had been constructed above; so different are the effects after passing over a large extent of flat country of the continuous swelling of the river and a flood which alone attained a much greater height, but was transitory in its nature. The same fact I observed in my enquiries about the flood of 1841, which was also but little regarded below Kallabagh. With reference to the running off, of the flood-water, it is difficult to speak with much precision. There was a violent storm of rain about Attok on the 7th August, and I know that storms in the Himalayas are often very wide spread and extend far down into the plains, not I mean exactly synchronously, but about the same time a disturbance will be found to have occurred over a large tract, in some parts snow, in others rain, and in others again wind and dust. In the summer of 1855 I thus traced two storms by their visible effects, and by enquiries from European Officers, the one nearly north and south, and the other westward—the directions in which I happened to be travelling—and each for a distance of about 300 miles.

It is possible then that the storm I speak of may have been a portion of one which swelled the pent-up lake, and issued in its outburst, but whether this be the case or not, the probable occurrence of rain in the hills about the time of the flood makes it impossible to assign any correct date of its subsidence.

The fall was at first slow, but the river was about 8 feet below its maximum by sunset, during the 11th the water however continued higher than the yearly flood ever attained to, and it was not till the afternoon of that day, that the boatmen would venture to man a boat to go down, alleging that all their usual land-marks were covered, and that without them they dared not navigate the stream.

During the night, however, the river fell a little over 20 feet and during the 12th it had, in actual height, returned very much to the position it occupied before the flood came down. But the stream was very violent and disturbed, for there had taken place on a grand scale the action which on a small one is annually repeated in August and September, viz. the filling up of the bed above strangulations, and at other points where a check is imposed on the velocity, with *detritus* of a solid character brought down from above. This induced much swell and great rapidity over these banks, and the process of their being cut away from down stream upwards made itself apparent. For several days the ferry at Attok was nearly closed on this account, and the boatmen pointed out with some apprehension very rough water in places where it had never been observed before. Gradually the shingle banks were removed from under the main stream, but it appears that there is still an unusual amount of *detritus* in the bed at Attok, and that the surface of the stream is sensibly raised thereby.

With regard to the "effects of the flood" I have little information about the tracts much above Attok; but I should have known if there had been extensive loss of life or property. That these escaped so far I attribute to the warning received about one month before the occurrence, and which, though under-valued by most of the officers to whom it was made known, was less easily disposed of by people living on the very bank of the river and bearing in mind what had happened only seventeen years before.

Without precautions taken, and I know that they were very general as far up as my information reached, such immunity as resulted could hardly have taken place; for the flood must have passed during the night from near Chelass to a little above Attok, and though the upper part of this tract, say as far as Torbela, appears more scantily peopled than either above it or below it, some of the villages near the river are situated within the rocky channel and placed upon the deltas of detritus brought down by small tributaries.

In such situations they are of course greatly exposed to the danger we speak of; and had no warning been received more injury than appears to have taken place must have ensued.

Where the flood came down during the day, as it did probably

nearly all the way above Chelass, and certainly every where below and west of Attok, people unless caught in some peculiar position could without much difficulty escape, except, as always happens in such cases, the few who, by over-eagerness to save property, expose their lives to foolish risks. There were very few human bodies (not above three or four apparently) seen to pass Attok, and the cattle and stacks of grain, straw, &c. which came down in considerable numbers belonged principally to the vale of Chuch.

Accounts regarding the catastrophe of 1841 agree in stating that many bodies were seen to pass Attok, and allowing for the probable amount of exaggeration, it is I think unquestionable that a very considerable loss of life then occurred, and had it not occurred then, there would probably have been more to chronicle now. The great cause of difference is clearly the experience of effects and the expectancy of repetition in the present case. A flood of the sort having happened within the memory of all the grown population, and having proved very fatal, as soon as warning was received in 1858 the people not only took precautions, but became prepared, on observing or hearing of anything unusual on the part of the river, to place themselves at a safe distance from it; without the experience of a similar disaster it was hard to tell what was going on or where it was to stop, and thus at Nowsheera some people placed their property on the top of their houses when the rise over-stepping their calculations, destroyed both house and property.

At Attok again I saw natives, who had in mind what they had heard of the previous flood, go off at once up the hills, while the river was rising, though quickly by no means alarmingly so. It is also to be borne in mind that the former flood was much greater, for not only did it over-top that of 1858 by 12 feet at Attok, and the addition of a single foot in height to a torrent of depth, width, and velocity such as the Indus then presented would have been a very great increase indeed, but occurring as it did in May when the bridge-of-boats was up at the lower site, it had a much lower level to start from. For the bridge in question has never been held by the native boatmen after the submergence of a rock near which is their well known water mark, and the actual rise which took place in a few hours must therefore have been upwards of 80 instead of about 55 feet.

Now this greatly added to the danger, for people who found the water coming down were, from having had no experience of the sort of thing before, peculiarly liable to fall into the fatal error (by which most of the lives lost were sacrificed) of getting upon knolls or other rising ground, on which they found themselves surrounded and cut off before they were aware. In the present instance the civil officer applied to me in behalf of some individuals who were thus surrounded, near a village a few miles above Attok; they most fortunately escaped through the flood not rising over their knoll, and their waiting till an exit was again provided by the subsidence of the waters. Had the stream risen a little higher, their case was nearly hopeless; for of course under the circumstances, no means of assistance could have been brought from a distance. At Attok many of the houses in the Mullah Tollah or boatmen's village, just below the fort, were demolished, so was part of the opposing village of Khairabad, but in both cases the property was almost entirely saved. In the Chuch valley lying between Torbela and Attok, a few villages were wholly or partially destroyed, and in the valley of the Cabul river all those near the water as far as Nowshera. But in both cases the principal losses were in grain and other field-produce, and in cattle, both districts being low and well cultivated. Heavy loss was also sustained, principally by householders, at the station of Nowshera, and by Government in the destruction of roads and bridges, and stores of various sorts collected at Khairabad opposite Attok. On this point some interesting information regarding the vicinity of Attok will be found in the report of proceedings of a special committee of which Major Robertson, Lahore and Peshawer Road, was president; and which was assembled in September last with the view of considering points relating to the catastrophe which had just taken place.

Below Attok most of the villages are placed on the high banks, between which the river runs and there is hardly any cultivation near the water so that no damage of any note occurred till at Mekkadd about 80 miles below Attok, where upwards of 100 houses were demolished and some cultivation destroyed. Marree also suffered, though to a less extent, and Kallabagh, the last place where injury of that sort occurred, lost some 10 or 15 houses.

Below this, the chief damage done was the eating into the land on the right bank, an action which appears to go on, though in a very minor degree, almost year by year. For some little time as the water was falling the process was rapidly carried on, so much so that I saw the people busy cutting down fine large trees in order to anticipate the otherwise certain loss of the wood by the agency of the water.

All common mud and stone buildings on which the water rose to any extent were of course destroyed, no buildings of substantial masonry were, as far as I know, subjected in sufficient measure to the test. The Nowshera Barracks were not seriously injured, but they were not exposed to the violence of the stream, and the lowest of them had not more than 5 feet of water in it. A good many trees were certainly uprooted, because we found several cast up on the subsidence of the waters; but trees were not prominently observed floating down, and except in circumstances like those noted near Kallabagh trees were rather destroyed where they stood than carried away.

The upper waters of the Indus, where I conjecture the stoppage to have occurred, run through a country almost destitute of vegetation and it does not appear that along the course of the main river there are forests so situated as to have been affected by this flood. A good deal of drift wood was floated out of the creeks into which Nullahs coming down from the more wooded country empty themselves, but this occurs always on the river being greatly flooded by the summer rains, and on this occasion was not a feature of unusual prominence.

Dead animals too were rare. The higher Indus valley is very destitute of cattle, and part of what did exist there probably owed their safety to the warning communicated to their owners.

The banks, where not rocky, suffered according to the set of the stream, but not at any place that I know of to any very remarkable extent except below Kallabagh, to which allusion has already been made. This extended from a short distance below that town to near Esankheyl, varying of course at different points. The greatest action appeared to be about 5 or 6 miles below Kallabagh, as the river was falling.



Fresh channels were opened in different parts of the river's course, where it is not circumscribed by rocky banks. The most noteworthy was at Attok, just below the seraie which lies up stream of the Fort. This is below the junction of the Cabul river, where the real bed consists of a double trough worked out in the slate Rock, which comes to the surface in the centre. This trough is 1300 feet broad, and hitherto since 1841 the river has in the cold weather run altogether under the right bank, leaving the other hollow filled up with large blocks of granite, boulders of various sizes, and sand. Since 1849 this has sometimes been entirely dry and sometimes has had an insignificant rill running over it, the tendency being for the rill slightly to increase year by year. But before the prior flood, a stream of considerable size ran here, and now again we have one upwards of 300 feet wide and about 5 feet deep. The river moreover seems to have set the materials in the bed above, so that a tendency to pour more and more water into the new channel has been established. The boat bridges now consist of one-third more boats than used formerly to be sufficient.

A little below Kallabagh again, where the set was so marked upon the right bank, its result has not been, as might have been expected, to deepen the channel running under that side; but by encroaching on the land it has actually shallowed it, so that the navigation, which was conducted exclusively in that channel formerly, cannot now make use of it, but is forced into another which was not previously passable for boats.

I do not think however that this change will prove of a permanent character.

Silt deposit has taken place to an enormous extent wherever there has been a checked or diminished current, particularly in the Chuch valley above Attok, the valley of the Cabul river, and every Nullah and stream opening into the river. Of all the effects produced, this is the most striking and will doubtless prove the most lasting. In constructing the Road Trans Indus, we passed over for several miles the silt deposited by the flood of 1841. Where cultivation had been carried over it, it was no longer to be recognized, but, where the land had been left unused, it was still found overlying, in the shape of a fine grey admixture of sand and clay about 15 inches

thick, the very different natural soil below. In August 1858 the Trunk Road for nearly four miles to the East of Attok, and on the west, wherever sufficiently low to come under the influence, up to beyond Nowshera, was buried under this deposit. The total length so covered was 12 miles, and the depth averaged one foot, while wherever the silt was left on the road it equally covered all ground on the river side and a good deal on the upper. The water of the flood was surprisingly muddy and wherever not agitated by a violent current deposited this silt in abundance. It seems, as far as I have been able to ascertain, that this silt is highly injurious to garden ground—and there is a good deal of vegetable cultivation near Attok—but that for the ordinary cereals it does not do any harm when ploughed up with the subsoil. The natives complain of it as burning up their cultivation through its not retaining a certain quantity of moisture and from the quantity of sand it contains. Where laid thickly and in sheltered situations, it remained in the form of a sticky mud for 2 or 3 months; but in the open fields it cracked in every direction, and in about a month and a half was fit to be ploughed up. Going from Attok towards Nowshera the extent visible was very great, and, before the grass and weeds burst through the cracks, the appearance was that of very striking desolation. But no where was this objectionable deposit productive of more annoyance than on the Grand Trunk Road, which, in spite of the measures taken at once, was impassable for about ten days, till the silt dried; and when that process was complete and the cake got broken up, it issued in a light fluffy dust, which causes a heavy drag on all traffic; and in dry weather, rises in clouds almost unbearable. All the road which has thus suffered had been metalled with shingle, was in all respects nearly finished, and was beyond all comparison, the smoothest and most pleasant piece of road between Lahore and Peshawur. It sustained no injury of any moment beyond what I have particularized; and it was not at first, nor till some three months had elapsed, that we became fully aware how much the silt deteriorated the road surface for purposes of traffic.

A good deal has been done to remedy the injury and in the course of another year it is to be hoped that it may be entirely effaced. The silt appears to consist of very fine sand with just sufficient

clay to cement it together, and if it could be kept damp (not wet) would yield a soft, but, for light traffic, a very pleasant and suitable surface.

The last point to which attention is directed is the peculiar effects of the flood upon the Cabul river.

The slope of the bed of this river is a little under 2 feet per mile and very uniform throughout the part affected. The directness with which it lies contrary to the course of the Indus has already been noted, and it would appear that the flood water, finding vent that way, ran over the down stream of the river, no doubt checking it and interfering with it in some degree, but probably not altogether destroying it.

The velocity with which the flood passed over the Cabul river was probably at first somewhat greater than what it had through Chuch, diminishing as it ran up. Nowshera was reached about 8 A. M. giving a mean speed of upwards of 10 miles per hour. The first effect observed there was, that the water was running backwards a little more rapidly than it usually ran forward; so singular a statement, as it would appear at first sight, was naturally, till often reiterated, met by incredulity. But when the fact became certain, there could not be much hesitation about the cause, especially as it was well known that on the prior occasion great destruction had taken place at the city of Nowshera, and as the residents in the cantonments were well aware of the report that another such flood might be expected. Soon light materials, particularly stacks of wheat-straw, were seen floating up, and these were heaped against the bridge of boats, which now curved up instead of down stream, and at last in the course of the forenoon broke up by the snapping of the two strong cables (one inch and seven-eighth inch) which, heavily fastened down at their extremities, and passing over low towers, supported the boats against the stream. These being now in part released were carried up the river, and some were stranded on the open plain 7 miles above. The flood still continued rising and was at its maximum at Nowshera about 3 P. M., about which time the last of the dwelling-houses, which were mostly built between the Trunk Road and the river bank, fell to pieces. It was observed that such of the houses as were not provided with upper windows gave the appearance of a

sort of blowing up when they fell after the water had covered the doorway. There must have been, on such occasions, a certain amount of compressed air within and while I don't think that it could have lifted the roof, yet, when the walls gave way and the structure fell, it was to be expected that the air would make its exit through the breaking roof, and so carry a cloud of dust up with it. The barracks being of brick masonry (and particularly good brick masonry,) and being on higher ground than most of the other buildings in the station, escaped without material injury. The flood now reached about 30 miles up the river, but stopt short by about 6 miles of the point where that of 1841 was distinctly to be traced to.

The height attained in the lower part of the Cabul river valley was very striking. It appeared to surpass anything reached near Attok. The causes I think were, that below the junction the right bank, on which the Indus would infringe, is bluff, and a side-current would be set off up the Cabul river, while again, as is observed of the tide, which in gulfs far surpasses the height attained in the open sea, the water, pouring in through a narrow opening and spreading out into the valley beyond, would maintain a fall in that direction; and before the check reached back again to the mouth a quantity greater than the fair capacity of the closed *sac* would have been forced into it.

The stream turned perceptibly by the evening, and ran down during the night, and this circumstance was the cause of much loss of property which in the day light might have been saved. Natives appear also to have had a dread at Nowshera of entering the water on account of the number of snakes and rats which were driven from their holds as the water rose. Nothing of this sort was observed at Attok, though there were a few serpents in the water. This is usual however in the large rain floods which occur yearly.

During the morning of the 11th household furniture in considerable quantity from the station of Nowshera was seen to pass Attok; and stacks of straw, Persian wheels, and such things, in large numbers from the valley of the Cabul river.

The deposit of silt was very great throughout the valley, as might have been expected in such a blind opening, and the water, after the

turn, ebbed away with sufficient gentleness to leave it nearly undisturbed over all the open ground beyond the actual banks of the river.

The out flow in the bed also does not appear to have been peculiarly rapid, and no remarkable cutting away of the original solid banks was observed.

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*Letter addressed to R. H. Davies, Esquire, Secretary to the Government of the Punjab and its Dependencies.—By Major J. BECHER, Deputy Commissioner, Cashmere, 1st July, 1859.*

SIR,—I have the honor to acknowledge your letter of 2nd April, 1859, directing me, in accordance with the instructions of a despatch from the Secretary to the Government of India in the Department of Public Works, to ascertain the particulars of the recent inundation of the river Indus in August 1858, and to trace the residence of certain syuds of “Kangri,” or “Kangra” who are reported by Captain Henderson to have conveyed to the boatmen of Attok, a written warning of the coming danger.

When your communication reached me, I addressed Captain Sandilands (who is Officiating at Attok during the absence of Capt. Henderson) requesting him to send me the original paper, from which I should best be enabled to identify the authors; I also asked him to record the evidence of the boatmen, who had affirmed that the letter was authenticated by the same signatures as that alleged to have been received by them in 1841 on the occasion of the previous flood.

It seemed surprising that such an intimation should not first have reached Jehandad Khan of Umb, the principal Chief on the river's bank above Attok, for if it came from the source of the obstruction it would have been passed downwards from point to point, as had, I knew, been done in 1841.

Captain Sandilands replied that no document had reached the boatmen direct,—that the writing alluded to was a copy, which had been forwarded to the executive Officer, from the Office of the Assistant Commissioner at Attok; and he appended a copy of this and the depositions I had requested.

The deposition of the Jemadar, and head boatmen of Attok, is to the effect that their communication "to Captain Henderson related only *to the flood of 1841* in the reign of Maha Raja Sher Singh when such a letter had come to them; they remembered only the name of Syud Kasim, but not where he lived. On the present occasion they had received no written warning nor any reliable information—only the general rumour."

The copy of the letter sent by Captain Sandilands was dated 29th Mar. 1915 S. (about 10th July, 1858,) bearing the seals of "Syud Jumal" and "Syud Kasim," addressed to Zerdad Khan, Meerdad Khan and others of the Tarkheylee tribe, living at Kazeepore, near Huzroo.

I then wrote to the Assistant Commissioner and obtained the original letter.

Syud Kasim, and Syud Jumal are brothers—Syuds, generally known and respected, living at "Kalinjur" in the Jagheer of Jehandad Khan near the Indus, in Huzara. I know them both well, and Syud Kasim had informed me of the general report that the river was obstructed somewhere in its upper course.\* The letter was at once acknowledged; they had written it to their marriage relations (whom I also know) on the authority of Jowala—a trader of their village who had received, and read in their presence a Hindee note from his brother Khuzana of Umb (Jehandad Khan's place) informing him that he (Khuzana) had learnt from intelligence which the Khan had received, that the river was shut up in its bed, and therefore he had sent off his property for safety.

Khuzana being called, stated that he was with Jehandad Khan at Bara (on the hills above the left bank of the Indus) and that the Khan advised him to remove his property from Umb, as one "Nasir Shah" of Bimbal (a village two days' journey from Umb in the independent country of the Akazyee tribe) the brother of one of the Khan's servants, had written, that news had reached from a Raja "Gohreetan" or "Gohr Aman," that two tributaries of the Indus were closed.

\* I made this generally known to all the villages of Huzara on the Indus, telling them to be on their guard and to make what arrangements they thought best.—Scarcely any loss occurred to property and none to life.

He (Khuzana) did not know who this Raja was, or where he ruled ; he believed he was somewhere "*high up the river.*"\*

Jehandad Khan had died in the interim, but his minister Mahamud Ruffahn stated that the Khan had received no message or writing from any Raja, and no more authentic account, in support of common rumour, than a letter from "Nasir Shah" of the Akazye tribe, brother of Gholam Khan, one of the Khan's servants, which contained no particulars beyond the information of persons coming "*from above,*" that the river was somewhere closed. The Khan, however, took the precaution to remove his effects from the river's edge to Dogana. He had no means of acquiring *certain* information, having no communication with the Chiefs above ; but in 1840-41, just before the former great flood, a writing on the bark of the birch tree (bhoj putta) was sent down the river from above as a warning ; it was not known from whence ; but was said to come from a tribe of some name like "Hoodur."† It conjured all men, Hindoo and Musulman, to fly from the river's side, and was couched in general terms."

I then addressed Syud Umran of Sultanuh on the Indus, a man of great repute, as the brother of Syud Ukbur Badshah of Swat, asking him, if he had received intimation of the recent flood of 1858. He answered that he had received none in this instance ; but that, in 1841 Syud Ukbur had received several communications from priests (Ool-mah) of Gilgit.

Hence then, as to the writing sent down from somewhere near the site of the barrier of 1841, there is no doubt, it is universally spoken of in Huzara ; and, since I have been in Cashmere, I have learnt that Raja "Kurreeem Khan" of Gilgit sent a warning *written on bark* to the inhabitants of the plains, the bark being used to convey greater credit. But as regards the late inundation of 1858, no such communication from the spot seems to have been made.

\* Gohr Aman is the Raja of Yussim who lately defeated the Garrison of Maha Raja Golab Singh in Gilgit, deposed the protected Raja of Gilgit (a minor,) and seized his country. He is chiefly known from his custom of selling men as slaves or exchanging them for dogs.

† There is said to be a village named "Hoodur" under Gilgit on the borders of Chilass on the right bank of the Indus ; though it does not appear in the map.

As I mentioned in my letter of 29th March last, Captain Henderson had travelled from Cashmere towards Ladakh, and up some portion of the course of the "Shayok," one of the main tributaries of the Indus, had seen huge glaciers borne down or projecting into the stream, and in all probability had read Captain Alexander Cunningham's book on Ladakh, where this "cataclysm" of 1841, as well as those previous to it,\* is fixed at 30 miles below the village of Sasserh, and 20 miles above the junction of the river Chang Chinmoo with the Shayok.†

Following up this direction on the map,‡ he found near the head of another branch, issuing from the Nubra lake, the village of Kangree, which seemed to represent or resemble that from which the letter of the Syuds came.

But as the letter from which the deduction is drawn, proves to have travelled only a few miles from the Syuds of *Kalinjur in Huzara* to the Tarkheylees of Kazeepore, and as I can learn nothing of any Syuds of Kangri,—I have no doubt that the mistake has arisen from the similarity of the Persian letters in the two names, and I think this disposes of the questions of the previous warning and of the locality of the informants.

It is certainly very desirable to ascertain the locality of the late obstruction, and I have purposely deferred my reply, as I was on the point of leaving for Cashmere where I should have the greatest facility for enquiry; but in my letter of 29th March I have already indicated the spot as in the vicinity of Gilgit. This was the result of my enquiries from the frontier beyond Huzara, and of information communicated by the authorities of the Maha Raja of Cashmere,§ whose Fort of Boon-

\* In 1826 and 1833, A. D.

† See Cunningham's "Ladakh," Page 101.

‡ Map of the Punjab published in the Office of the Surveyor General of India.

§ Translation of a letter dated 15th Asaj, 1915 or 30th September, 1858, from Wuzer Poonoo, Offg. Governor of Cashmere, to the Vakeel of the Maja Raha of Cashmere at Huzara.

\*\*\* The Hurkura (messenger) I sent to Iskardo has returned and reports that the river coming from Gilgit joins the Attok (Indus) 4 coss above the Fort of Boonjee, and a branch coming from Nuggur and Hoonza joins the Gilgit river below Gilgit. The late inundation proceeded from these "Hoonza", and "Nuggur" rivers, there was a lake above Hoonza in the mountains, the waters of which were dammed up and have now been set free. Have the goodness to communicate this to the Deputy Commissioner of Huzara."



jee in Hussoora district is situated on the left bank of the Indus, between the confluence of the rivers of Gilgit and "Astor" or Hussoora, and watches the road to Gilgit.

Since I have been in Cashmere, I have carefully questioned men from Gilgit, Hoonza, Nuggur, and Ghor, and particularly two (Mahomed Khan and Hunneefa) who had left Nuggur only 24 days deputed by the Raja Zaffir Zaid Khan to ask the aid of the Maha Raja against Raja "Gohraman" in Gilgit. All accounts agree that the *late stoppage*\* was of the river of Hoonza, about a day's journey above the fort and town of that name, and 4 or 5 days journey Northward of Gilgit. It was caused by the subsidence of a mountain side called "Phungurh" on the left or Nuggur bank, from the action of rain and snow above, and of the stream below, in the winter of 1858. The vast fragments of rock, and earth, and trees and drift wood, dammed up the *narrow bed* of the river for 6 months; when the waters swollen from the melting of the snow in the mountains, burst a sudden passage in August, and destroyed many forts and villages and lands of the Hoonza and Gilgit districts. The lake mentioned by Wuzer Poonoo was probably the back water of this huge dam.

Captain Montgomerie of the Engineers, who has charge of the Grand Trigonometrical Survey in Cashmere has arrived at the same conclusion regarding the site of this barrier of 1858, by an enquiry altogether independent of mine.

I have already reported that men† were deputed by me from Huzara in the direction of Gilgit to make personal enquiry and if possible see the very spot; but letters from the border of the Kohistan country with Gilgit, received on 26th May, declare their inability to proceed further, because of hostilities between the Chief of Nuggur and those of Hoonza and Gilgit; "the road is closed to all travellers, and four men, who lately went from Chilass, were robbed and put to death."—I had hoped to have been able from their enquiries to confirm or dispel a present disquieting rumour that one of the five tributary rivers near Gilgit is still obstructed.‡

\* Of 1858, A. D.

† Izzuttoolla Khan, Syud Suffdur Ali.

‡ It was reported originally that two tributary rivers had been stopped, of which one has set itself free and the other remains closed.

The Maha Raja's Officers in the Fort of Boonjee have on my applications, sent back several replies said to be from the best information, that the river (above Chilass) is nowhere impeded, but is rolling on with its accustomed volume; the latest report is of 8th June, 1859 (28th Jait, 1916). Those whom I have seen, inhabitants of that country, say the same; the two men of Nuggur, whom I have named above, only add that the bed of the Hoonza is still somewhat encumbered by remaining rocks, and that a guard is maintained there by the Nuggur Raja to prevent the crossing of the hostile people of Hoonza by throwing over a bridge of rope or timber. Nasir Shah of Bimbhul, the man of the Akazyé tribe whose information conveyed to the Khan of Umb proved so true—although he is very far from the spot—now writes that during last April there was general alarm of the flood coming anew, and all people removed their property; but that they have now brought it back, although no certain information has come, one way or the other.

My opinion is, that there is now no real cause of apprehension; it is only natural that the rumour should be revived—it was so after 1841; but the certainty is hard of attainment in a country so cut off by difficulties, political and geographical—and beset with so much disunion and enmity and ignorance and jealousy and entire disregard of all but immediate interests.

As regards the removal of the obstacle (when such an accident may again occur) by our scientific efforts, I think it is impracticable; the labour of removing such vast masses of mountains, or of glaciers, would be immense; and as our motives would not be understood, the party would require the protection of an army if in the direction of Gilgit. None of the Maha Raja's people even can venture there. An expedition against Raja Gohraman is now being prepared.

Although it is somewhat beyond the limits of the present enquiry, I have taken advantage of the present occasion to endeavour to make sure of the site of the obstruction of 1841, A. D.

Captain Alexander Cunningham places it 280 miles above Iscardo, near the head of the Shayok branch of the Indus, about half way in a distance of 50 miles, along which the road to Yarkund was said to be inaccessible, when he and Captain Strachey and Dr. Thomson visited Ladakh in 1847; but none of these officers saw the spot thus indicated.

Captain Cunningham records three inundations of the Indus since A. D. 1822, in the years 1826, 1833 and 1841.

In 1837, Mr. Vigne travelled beyond Iscardo, and learnt that a few years previously (1833) a serious flood had come down the valley of the Shayok, which was attributed to the bursting of a glacier by which the waters of a large lake, called the Nubra Tsuh, had hitherto been upheld; and he added that "so well was the cause of this inundation known to the people, that it was believed that the same terrific visitation might be expected again at no very distant period." Captain Cunningham, who quotes this passage, immediately adds "*the expected cataclysm occurred in June 1841, but it was immensely greater in volume and more devastating in its effects than the previous inundation of 1833.*"

In the edition of 1844, Mr. Vigne adds a note as follows, "Since writing the above, I observe that a letter from Dr. Falconer dated 8th August, 1841, has been read at the Calcutta Asiatic Society, containing a notice of some devastating inundations that have taken place on the Indus below its debouchure; and it is highly probable that the glacier of the Nubra Tsuh may have again been broken up. \* \* \* \* \* From the openness of the bed of the river, as seen from Acho, I should also imagine that the obstruction must have happened above the place marked on the Map, "Makpon-i-Shang Rong."\*

Captain Cunningham proceeds to give the testimony of the people of "Chulung," "Tartuk," "and Tertse" (places on the bank of the Shayok river, but about 130 miles below his assumed site of the accident) and affirms that the effects could in October 1847 be traced to a height of more than 20 feet above the stream, where straws and twigs were massed together in lines 2 or 3 feet broad.

As Captain Cunningham's own route did not include this portion of the country, the above information was probably collected by Dr. Thomson. At that season (October) the river always falls considerably, so that these lines of grass and twigs may possibly have

\* This spot is opposite Gilgit, and at least 400 miles below Sasserh. It is described by Captain Cunningham as a place of craggy defiles, where the waters of 1841 must have been massed up at least to 100 feet. It is near the point where the late obstruction of 1858 is asserted to have occurred.

been the deposits of the summer high water, or they may have been the residue of 1833, or of another local flood. It seems certain that an inundation of the Shayok did occur in A. D. 1833 ; it is corroborated by the information I have received in Cashmere ; and as every one knows what pains is required to prevent a confusion of dates and occurrences in any account given by an Asiatic, and how difficult it is to keep them to one precise clear account, it is not improbable that the calamity of 1833 was referred to in the testimony of the inhabitants of Chulung, Tertse, &c., whose Tibetan language would require an interpreter, and who must have been ignorant of the flood of 1841, if it took place at any distance *below* their villages.

In reading Captain Cunningham's account, I am impressed with the idea that a conclusion was at once drawn that the origin of all the cataclysms of the Indus was from one cause, and at one and the same point, high up among the glaciers of a tributary stream where the waters are chiefly generated by the snows.

In my letter of 29th March, I stated that this opinion was not borne out by native statements, and since I have extended my enquiries, I am the more convinced that the great flood of 1841 occurred about 400 miles *below* the site specified by Captain Cunningham,\* and was caused by the arrest of the *main Indus*, across which a mountain called Ultoo Kunn subsided at a narrow place about five coss south of "Ghor," two or three coss above Tuleycha, and four or five coss below the Fort of "Boonjee" (in the district of Astor or Hussoora, where the Maha Raja of Cashmere has a garrison).

Boota Khan, a man of Ghor, in the service of the Raja of Nuggur, now in Cashmere gives the most exact account, and declares that he saw the actual dam ; that some men of his village chanced to be washing in the river for gold, and were buried by the fall of the soft soiled mountain, which he attributes to an earthquake. He also saw the spot after the waters had forced their way.

I directed Meerza Syfodeen, the Cashmere newswriter to refer to the reports of that time written by his father, Meerza Ahud, to Sir George Clerk at Umballa ; and those of April and June 1841, before

\* As near "Sassscrh."

and just after the event, seem to refer it to the neighbourhood of Hussoora and Gilgit.\*

The inundation of 1833, caused by the accumulation of ice in the Shayok branch, was more local and comparatively harmless; it is not even known in the plain country of Huzara, Chuch, or Attok. Captain Cunningham describes that of 1841 as "immensely greater in effect," which is hardly to be explained, if the cause and the position was the same in both. I have not been able to consult Dr. Thomson's work, nor the paper of Dr. Falconer addressed to the Asiatic Society in 1841.

The recent cataclysm of August 1858, is I think proved to have been that of the *Hoonza branch*, which at least affords an example that the site can vary; this is 300 miles from Attok. Yet no remarkable difference was previously visible in the state of the lower Indus in Huzara or at Attok; whereas in 1841 (before the flood) the river was fordable, and shrunk wonderfully to a small stream, I do not think it would have been so, had only one tributary like the Shayok been dammed up 600 miles above at Sasserh. Again, in 1841 when, as I believe, the main Indus, after the junction of many tributaries, was arrested, when the barrier was burst, down at once in one overwhelming irresistible wall came the "bore" of discoloured waters, defying all hope of escape, while latterly in 1858, the rise though great was gradual, and afforded a warning for flight.

\* Copy of Intelligence from Meerza Ahud in April 1841.

I. "From Hussoora and Gilgit, news has arrived that in last January a mountain (by reason of an earthquake) fell into the Indus or Attok river, and has closed the course of its stream, up to the 1st May, 12 coss of lands in the Gilgit district has been submerged. Jubbar Khan the Chief of Hussoora sent in a note to Cashmere that the waters would continue pent up for another month, and after that would force a passage in *some direction*."

From the above in June, 1841.

II. "From Gilgit the news is that the waters of the Sinde or Attok by reason of the fall of a mountain were brimmed up *in the direction of Gilgit* for a long time, and there was a lake reaching to a distance of 18 coss; high hills were on all sides; when it had risen immensely, the river forced its way with great velocity and is now pursuing its natural course—many villages of Yusoozyc, Chuch and Huzara have been destroyed by the deluge."

It seems then, from what has happened within our knowledge and from the character of the many tributaries of the Indus, and of the mountains, and rocks and glaciers which confine and check their course, that these accidents may often occur, and in many different places; it must always be exceedingly difficult to obtain accurate and timely information, and scarcely possible always to determine the exact place, but as I believe that a stoppage of any tributary above Iskardo or at least Ladakh, would hardly affect our territories on the Indus, and as the Maha Raja of Cashmere has posts along the main river, I think that information may always be had through Cashmere, the authorities being enjoined particularly to observe the river, and in the event of any suspicious fall or rise to communicate with Gilgit, Nuggur, Yussun, Hoonza and other countries beyond their border, with some parties in which, the stronger or the weaker, they have generally some relations.\*

The Deputy Commissioner of Huzara, in the event of a rumour, should endeavour to obtain intelligence from Chilass and from Koli and Palus in the Kohistan country, which may best be managed through the Syuds of Khagan. The Khan of Umb also should endeavour to cultivate some acquaintance with influential men, or Moollahs of the Kohistan, and Gilgit country, and the Akhoonzada of Kotah in Yusoofzye, who has great religious influence, is also a man likely to acquire the best information, if the several chiefs near Indus who are his votaries will press the matter on his attention, as it has now been proved that these calamities may occur at any time.

A little exertion will generate a valuable intercourse, and dispel the ignorance and marvellous indifference which now exists, and almost peoples with "anthropophagi" the "upper regions" of the Indus.

\* I may add to the difficulties of communication, that for half the year the passes in the mountains are closed by snow, and intercourse is nearly impossible.

*On the different Animals known as wild Asses.—**By* EDWARD BLYTH.

At least four distinct species—if the *Dshiggitali* or *Kyang* (*EQUUS HEMIONUS* of Pallas) be considered to differ specifically from the *Koulan* or *Ghor-khur* (*E. ONAGER vel E. ASINUS ONAGER* of Pallas)—have been confounded under the general denomination of ‘wild Asses’: and two of the four have likewise been designated ‘wild Horses’; a name to which they are less entitled, as all agree in exhibiting the few structural distinctions that characterize the *Asinine* sub-group apart from the *Equine* or *Caballine*.

The systematic names bestowed by Pallas are so far unfortunate, that they do not apply to the particular species which were known by them to the ancient Greeks and Romans—one of which latter has only recently been discriminated by Professor Isidore Geoffroy St. Hilaire, by the name *EQUUS HEMIPPUS*. This (from its habitat) is necessarily the *Hemionus vel Hemippus*, or ‘wild mule,’ of the ancients; whilst their *Onager* (as the name implies) refers as clearly to the veritable wild *E. ASINUS*, which, to this day, as formerly, exists in numerous troops in N. E. Africa, if not also in the southern parts of Arabia and island of Socotra. The *HEMIPPUS* of modern nomenclature is the representative of the present group in Syria, Mesopotamia, and the northern portion of Arabia, where designated by Col. Chesney the ‘wild Horse,’ as distinguished from his ‘wild Ass’ of southern Arabia; and it is the species figured in Wagner’s *Saugtheire* (1856), pl. 33, by the erroneous name of *EQUUS ASINUS ONAGER* of Pallas, from a living individual formerly in the Knowsley menagerie.

It should be especially noted that the great naturalist, Pallas, described his *E. HEMIONUS* from personal observation of the animal; whereas he describes his *E. ONAGER* only at second-hand, having never seen a specimen. Had he personally inspected the latter, it is exceedingly doubtful if he would have recognised the two as distinct species, or have considered the western animal to be the real *Onager* or aboriginal wild Ass. In his account of the *Dshiggitali*, he remarks—“On ne doit pas le confondre avec l’âne des

steppes nommé *Koulan* par les Kirguis occidentaux ; *les détails que je me suis procurés sur ce denier*, m'ont convaincu qu'il étoit l'âne sauvage, l'Onagre des anciens. Le *Koulan* se tien par troupeau dans les landes montagneuses de la Tatarie occidentale, comme le *Dshiggитай* dans les deserts de la Mongolie."\* Curiously enough, we at present know the *Dshiggитай* or *Kyang* more as a mountain animal, in the elevated wilds of Tibet, and the *Koulan* or *Ghor-khur* more as an inhabitant of the sandy desert.

The late Professor H. Walker referred the Tibetan *Kyang* to *EQUUS HEMIONUS* of Pallas ; and the *Ghor-khur* of this country is even more satisfactorily referable to *E. ONAGER* of Pallas, figured by Gmelin : but Professor Walker committed the extraordinary mistake of figuring and describing an Indian *Ghor-khur* for a *Kyang*,† so that the alleged distinctions which he has pointed out are valueless. However this mistake originated, there is no doubt whatever of the fact. The animal was procured and sent down to Calcutta by the late Mr. Thomason, Governor of the N. W. Provinces ; who was just in the position to obtain a *Ghor-khur* from the western deserts, but scarcely a Tibetan *Kyang*. No doubt it was sold to him as a *Puhária* or 'mountain' *Ghor-khur*, for this epithet is continually applied by the natives of India to any creature foreign to their own province, as the experience of readers who have been in the habit of purchasing animals in this country will readily testify. By what route it reached Mr. Thomason we are uninformed, as also how it came to be accompanied by a Himalayan pony from which it was inseparable ; but having compared Dr. Walker's figure and description with stuffed specimens of undoubted *Kyangs*, and with three living undoubted *Ghor-khurs* now in Calcutta, the conclusion here arrived at is irresistible.

\* *Voyages de Pallas*, IV, 305 (French edition, 1793).

In p. 309, I observe a statement which is worthy of especial notice, as being made by Professor Pallas. The existence of the pouch of the Great Bustard (*OTIS TARDA*) is denied by Professor Owen, though asserted by the Hon'ble Walter Elliot to be a characteristic of the Great Bustard of India (*EUPODOTIS EDWARDSII*). Of the former, however, Pallas thus writes—"Cet animal a un petit trou sous la langue, qui sert d'ouverture à une bourse aqueuse, qui est de la grosseur d'un œuf d'oie, et qui pèse souvent plus de trente livres. On ne connaît point ici la Petite Outarde."

† *J. A. S.* XVII, pt. II, p. 1 and pl. 1.



While identifying the *Kyang* with the *Dshiggitali*, however, Professor Walker little imagined that he was making the same mistake that he considered M. Frederic Cuvier and others to have done, in referring the *Ghor-khur* also to E. HEMIONUS. I find that the *Ghor-khur* accords to the minutest particular with the *Koulán* or E. ONAGER of Pallas, figured by Professor Gmelin from an occasional variety bearing a short humeral stripe (which is not rare also in Indian specimens of either sex),\* from the presence of which the identity of this animal with the true Ass has been generally but erroneously inferred. Of the two individuals then at St. Petersburg, which are described by Professor Gmelin, it may be remarked that his male only had the shoulder-stripe, and his female not a trace of it; and he was informed that individuals had been seen with a second shoulder-stripe. This I have myself observed in the domestic Ass, and even a third and fourth, more or less developed, the additional being of variable length, and given off along the back as far as the loins; though it is very rarely that more than a single stripe occurs, and I have seen only one domestic Ass without the shoulder-stripe. Many of our Indian Donkeys have also well defined transverse bars on the limbs, which are permanent for life (not, as described by Professor T. Bell, peculiar to the foal); they are often black and strongly contrasting, placed rather distantly apart, and they vary much in length. It is remarkable that some races of Horses also have the same markings. The well known 'Eel-back dun' of England is so named from its black dorsal stripe, bearing a supposed resemblance to an Eel; the Indian Káttýáwar or rather Cutch Horse has generally, in addition, the shoulder-stripe, and Zebra-markings on the limbs, black and very distinct and conspicuous; and the same may be observed of many of the Shán ponies, from the independent states north of Burma, many of which are brought annually to Maulmein, and not a few thence to Calcutta. I have seen one of these of the pale drab colour usual in the Ass, with the cross and the stripes on the limbs deep black and

\* Jacquemont notices such a specimen, which he saw in Barrackpore Park. *Voyage dans l'Inde*, I, 170. Vide also *J. A. S.* XXVI, 240. In Pallas's *Zoographia Rosso-asiatica*, which I have seen since penning the above, there is a coloured figure of E. ONAGER, but much too rufous in the particular copy to accord with the description.

most conspicuous, the dorsal stripe being continued down the tail just as in the *asinine* series; yet in all other respects it was a handsome robust pony, with copious equine mane and tail, shewing no approximation whatever to the asinine group in its structure or voice. Those who believe that the domestic Horse is a compound species, derived from a plurality of aboriginal races, may well infer that they perceive, in the markings described, indications of certain of those races.\*

In some examples of the *Ghor-khur*, as that figured by Dr. Walker (from a drawing from life by Dr. Cantor),† there are no traces whatever of markings on the limbs; others shew slight traces, more or less distinct, chiefly at the joints; and others again have the entire limbs strongly marked: but the stripes do not resemble those often seen in domestic Donkeys, or in the races of Horse referred to; in general they are wavy lines of fawn, often more or less crossed or reticulate,—but in some more regular and Zebra-like,—upon observing which, I remembered the description in Bell's 'Travels in Tartary' (I, 224), of the 'wild Asses' found in the country of the Tzulimm Tartars, "the hair of which is waved, white and brown, like that of a Tiger:" he "had seen many of their skins." So far as the limbs are concerned, this description is quite intelligible with reference to many Indian examples of the *Ghor-khur*.

\* It does not follow, because the hybrid offspring of the Horse and Ass is mostly infertile (the male mule perhaps always), that distinct species of the Equine or Caballine group, or of the Asinine group respectively, should not produce a prolific intermediate race, hybrid with hybrid. In the London Zoological Gardens there was formerly a triple hybrid, the sire of which was a Quagga, and the dam a cross between the Ass and Zebra.

The curious animal figured by Col. C. H. Smith, in his volume on the *Solidungula* in the 'Naturalist's Library,' by the name *Asinus hippagrus* (vel *equuleus*), appears to me to be a Chinese *hinny*, or offspring of the Horse and she-Ass. Its stripes might have been derived from either parent, if not and very probably from both of them. Col. Smith also figures what he terms an 'Eel-back dun' from the Ukraine, with the humeral cross-stripe but no limb-markings. In the text, however, he repeatedly alludes to those markings, as occurring sometimes in the 'Eel-back dun' race.

† *J. A. S.* XVII, pt. II, p. 1, and pl. 1. This published figure is bad, whatever the drawing may have been. There is no anatomy about it; and the grace and beautiful contour of the creature are not at all portrayed. The head, in particular and the haunch are exceedingly ill-represented.

It would appear that these limb-markings are never seen in the *Kyang*; but a narrow black ring adjoining the hoof would seem to be constant in this animal, as was first pointed out to me by Major Robert C. Tytler, the proprietor of the three *Ghor-khurs* now in Calcutta. This mark is also more or less developed in the *Ghor-khur*; but is by no means conspicuous in either race. In two stuffed specimens of the *Kyang*, old and young, in the Society's museum, there is no black shoulder-stripe, but in place of it the coat is there distinctly of a deeper shade of hue, so that the stripe is faintly indicated, as is best seen from a moderate distance. The same is observable, when especially looked for, in an unmounted skin. In one only of Major Tytler's three *Ghor-khurs*, there is a small narrow black line, on one side only of the animal, where the cross occurs in some individuals. In another *Ghor-khur*, which I saw in the Surrey Zoological Garden, there was an incipient cross-stripe, about an inch long on one side, and still less (the merest indication of it) on the other side. In the individual which Jacquemont saw in Barrackpore Park, he remarks that there was "une ligne noire transversale sur les épaules." Whether this cross-stripe is ever seen in the *HEMIPRUS* remains to be ascertained.

Sir R. Kerr Porter describes a "wild Ass" without even the dorsal stripe; and as he completed his sketch of it from a second individual which he killed, our incredulity should therefore abate somewhat, even though his account remains uncorroborated to this day. All other observers seem to agree in describing the Persian wild Ass to have the usual longitudinal dorsal streak. Thus, in Morier's 'Second Journey through Persia' (II, 201), we read—"The wild Ass is of a light mouse-colour, with a dark streak over its shoulder and down its back," which may imply that a cross-stripe was also observed. Porter, however, states—"The mane was short and black, as was also a tuft which terminated his tail; no line whatever ran along his back, or crossed his shoulders, as are seen in the tame species." Such an animal does not appear to have been met with by any other person! Prof. St. Hilaire suspects that it will yet prove to be a distinct species. As an example of the vague misuse of names in which many authors indulge, it may here be remarked

that in Kinneir's 'Geographical Memoir of the Persian Empire' (p. 42), these animals are actually styled "Zebras or wild Asses!"

The voice of Major Tytler's *Ghur-khurs* is a loud shrieking bray. It is decidedly different from that of an animal which I heard in the Zoological Gardens, Regent Park, which also was a distinct bray, but much less harsh and discordant than that of a Donkey. This animal was probably a *HEMIPPUS*; and Prof. Is. St. Hilaire remarks that the voice of the *HEMIPPUS* is notably different from that of the 'Hemione,' meaning the *Ghor-khur*. Also that "*le braire de nos Hemiones indiens, si l'on veut se servir pour eux de ce mot, diffère considérablement du braire de l'Ane, soit domestique, soit sauvage.*"\* When and where the distinguished Professor heard the bray of the *wild Ass* does not appear on the record; but the probability is that it differs little, if at all, from that of the domestic animal.

The *Kyang*, according to Major A. Cunningham, "neighs like a Horse;" and I suspect that it was upon his authority that Dr. Walker asserted the same, and that he had never heard the voice of the *Ghor-khur* which he described. Again, Mons. Huc remarks, of the *Kyang's* voice, that "*le hennisement qu'ils font entendre est vibrant, clair et sonore.*"† On the other hand, Moorcroft asserts that "his cry is more like braying than neighing;"‡ and in an admirable letter, signed 'Norman Leslie,' which appeared in a late No. of the *Friend of India* newspaper, giving an account of a Tibetan tour and of the sport obtained in the course of it (including the 'bagging' of a noble specimen of the wild Yak), the following passage occurs relative to the *Kyang*, which is well worthy of citation:—

"As the spectator stands on the elevated land by the water-shed, he sees to the north the course of the Sutlej running from east to west through a table-land which is 14,000 feet high, and intersected with ravines; the Himalayas to the south look but an ordinary range of hills scarcely so elevated in appearance as the range beyond the Sutlej which bounds the view, and in which to the eastward the

\* *Comptes Rendus*, December 31st, 1855, p. 1224.

† *Souvenirs d'un Voyage dans la Tartarie, le Thibet, et la Chine*, II. 221.

‡ Moorcroft's *Travels*, I, 443.

peak of Kylas rises conspicuous. On the plains between the ravines herds of Kyang feed; they are more *asinine* than *equine* in appearance, are of a light red colour, with white belly and legs, and have the hog-mane stripe down the back, and tail of an Ass; the head is disproportionately large, and *they bray instead of neighing.*"

I have also been assured by actual observers, familiar with the voice of the *Kyang*, that it is "as much like neighing as braying;" but this I do not comprehend. It must surely be either one or the other. A *neigh* is a tremulous expiration only. A *bray* consists of alternate expirations and inspirations. And there can be little doubt that the *Kyang* will prove to resemble the other asinine quadrupeds in braying and not neighing, notwithstanding the highly respected testimony of Major Cunningham.\*

The resemblance of the two animals is indeed exceedingly close, again notwithstanding the assertion to the contrary of Major Cunningham, Dr. Hooker, and others,—greater even than that of either of them to the *HEMIPPUS*, which has a conspicuously smaller head and shorter ears. The size and figure of the two would seem to be absolutely alike, with a heavy but well formed head, longish ears, rather a short neck, and body and limbs of exquisite *turneur*, indicative of extraordinary fleetness. I have not seen the living *Kyang* or *Djiggetai*, but the croup is distinctly higher than the withers in the living *Ghor-khur* or *Koulan*. The colour of the *Kyang* is much deeper and more rufous than that of the *Ghor-khur*, and there is considerably more of white about the latter. The *Ghor-khur* is of the isabelline or sandy hue of most animals of the desert, but with a distinct rufescent tinge; its dorsal stripe would seem to be generally much broader than in the *Kyang*, though varying in breadth in different individuals: but it may be remarked that this stripe

\* I have never heard the voice of the Quagga from which that species derives its name. That of the *Ghor-khur* is considered by Major Tytler to resemble exceedingly the cry of a mule. The truth might, indeed, be anatomically determined. Thus, Cuvier remarks, of the Ass,—“sa voix rauque (appelée *braire*) tient à deux petites cavités particulières du fond de son larynx.” *R. A.*, I, 253. Pennant, following Pallas, remarks of the *Tshiggetai*, that—“their *neighing* is deeper and louder than that of the Horse:” a description which most assuredly cannot be reconciled with the *shrieking bray* of the *Ghor-khur*!

varies much in width in the domestic Donkey, at least in the diminutive Indian race of Asses, being in some individuals of the latter quite as broad as in any *Ghor-khur*: this mesial stripe, however, seems to be broader down the tail in the *Kyang*, and is continued down to the black terminal tuft; whereas in the *Ghor-khur* (perhaps with exceptions) the line is narrow on the tail and terminates at some distance above the tuft. Again, in the *Ghor-khur* the dorsal stripe (which in both is of a dark chocolate colour rather than black) is more or less conspicuously bordered with white—as likewise in the *HEMIPPUS*,—and this white extends broadly and very conspicuously towards the tail and along the hind-margin of the buttocks, where in the *Kyang* (as also, I since find, in some *Ghor-khurs*.) the hue of the upper-parts is only moderately diluted. Again, there is a much stronger tendency in the *Ghor-khur* for the white of the under-parts to extend upwards from the flanks, in some so much as to join that bordering the broad dorsal streak, and so insulating the isabelline hue of the haunch; and the zebra-markings of the limbs, common (though not invariably present) in the *Ghor-khur* have been denied to be ever traceable in the *Kyang*, and they certainly are not so in three skins of the latter under examination. In conformity with the general tendency to the extension of the white, as before remarked, that of the muzzle also reaches higher in the *Ghor-khur* than in either the *Kyang* or *HEMIPPUS*; and, lastly, the humeral cross, when apparent, shews itself differently, being faintly visible in full development and placed very forward in the *Kyang*, while in the *Ghor-khur*, when it does occur, it is a black cross more or less developed, though never probably to so great an extent as in the true Ass.

Moorcroft, alluding to the Quagga, remarks that the *Kyang* is “without stripes,” (evidently meaning such as the Quagga exhibits,) “except a reported one *along each side of the back* to the tail. *These* were distinctly seen in a foal, but were not distinguished in adults.”\* In the Society’s stuffed specimens, especially when viewed from some distance, the dull ruddy-brown or rufous-chesnut hue (approaching to bay, especially on the head,) of the upper-parts becomes gradually but distinctly darker on the flanks, to where it abruptly

\* ‘Travels in the Himalayan Provinces.’ I, 443.

contrasts with the white of the belly ; and in an adult the jowl and sides of the neck are white, reaching nearly up to the mane at the setting on of the head, whence the brown above gradually widens backward to the shoulder ; the white of the under-parts also ascends above the *elbow-joint*, and posterior to the very dull indication of the shoulder-cross, which is not darker than where the body hue contrasts with the white of the flanks. The stuffed foal is generally a trifle darker, and a little different in the relative extension of its shades ; the dorsal stripe being also less sharply defined, though only in consequence of the hair being longer. No doubt that individuals vary more or less, like individual *Ghor-khurs*.

Comparing the hoofs together, the only difference that I can perceive consists in the fact that the *Kyang* skins before me are those of *wild* animals, with the hoofs duly worn by constant action ; whereas those of a *Ghor-khur*, belonging formerly to a captive individual, are much less worn and accordingly are not so shapely. The limb-bones present no difference whatever. In the skulls, the only diversity that I can perceive may be fully accounted for by disparity of age. We have the skull of a mature female *Kyang*, with its last molars long in wear ; and this corresponds with Major Cunningham's figures of the skull of a male *Kyang*.\* With these I compare that of an adolescent male *Ghor-khur*, with the penultimate molars just coming into wear, the last being enclosed within their sockets, the two foremost deciduary præ-molars (on each side above and below) about to be replaced, and a medial pair of permanent incisors (above and below) just passing through the gums. A Horse at this stage of development would be reckoned as  $2\frac{1}{2}$  years old. At this particular age, I can perceive no further difference than can be accounted for by incomplete development on the part of the immature *Ghor-khur*.†

\* *Ladák*, &c., pl. VI, p. 195.

† Since the above was in type, the Society has received from Major Lumsden, late in charge of the Kandahar mission, an imperfect skin and a skull of an adolescent male *Ghor-khur* from the vicinity of Kandahár. Its last molars were just coming into wear, corresponding to about four years old in the Horse. The skin shows the short summer vesture, and is of the same cream-colour or light isabelline hue as Major Tytler's three living specimens,—the true *desert colouring* ; and this hue suffuses the

Having thus elaborately compared them, it is impossible to agree with Dr. J. D. Hooker when he asserts that the *Kyang* "differs widely from the 'wild Ass' of Persia, Sindh, and Beluchistan," although "undoubtedly the same as the Siberian animal." He adds, that "it resembles the Ass more than the Horse, from its size, heavy head, small limbs, thin tail and the stripe over the shoulder [!]. The flesh is eaten and much liked. The *Kyang*-lah mountains are so named from their being a great resort of this creature."\* Trebeck's remarks on the figure of the *Kyang*, as quoted by Cunningham, apply alike to either race. The accomplished botanist cited would most assuredly not recognise, as distinct species, two plants from different regions which differed so very slightly from each other as the *Ghor-khur* and the *Kyang* differ in the animal kingdom. Indeed, so far as I can discover, the difference is only in

caudal region, which in Major Tytler's animals is conspicuously much whiter: the mesial dark line is very slight—almost evanescent—down the tail, in which respect all the *Ghor-khurs* differ from all the *Kyangs* under examination; and this stripe is not broader upon the croup than in an ordinary Donkey: there are no traces of markings on the limbs. The skull is unfortunately abnormal, being unsymmetrical and curiously deviating from the straight line, to the left at the occiput and to the right at the muzzle. The nasal bones are more compressed than in the *Kyang* skull; but this difference does not exist in Major Tytler's younger *Ghor-khur* skull, nor certainly in his three living animals, so far as a judgment can be formed on careful examination of them. There is an obvious deformity in the shape of the lower jaw, the *rami* of which approximate almost to contact underneath for a considerable portion of their length, and not quite symmetrically.

The only equine skull in the Calcutta Medical College is catalogued as that of a Horse; but it exhibits the true *asinine* contour, and is nearly as large as that of the adult *Kyang*. I do not think that it is a mule-skull; but rather that it belonged to a fine specimen of the large Levantine race of domestic Asses, which is occasionally met with in the N. W. of India, chiefly beyond Delhi. Had it been the skull of a wild animal, it would probably have been registered as such: and moreover, as a general rule, there is a considerable quantity of dark incrustation on the teeth of wild grazing animals, which I think is never much observable on those of domestic beasts: in the present instance, this is exhibited by the skull of a wild *Kyang* and that of a wild *Ghor-khur* under examination, and in no skull of domestic Horse or Ass, nor in the dubious Medical College specimen.

\* 'Himalayan Journal,' II, 172.



colouring, and this merely a difference of shades of hue and the relative extension of them !\*

As regards the geographical distribution of the *Kyang* or *Djiggetai*, it does not appear that aught has been added to our knowledge since the time of Pallas; and the same may be remarked of the distribution of the *Ghor-khur* or *Koulán*, excepting that the proper habitat of the *HEMIPPUS* has to be subtracted from that of the *Koulán*, and the supposed migratory habits of the latter are not confirmed by subsequent observation. In the depth of a Khiva winter, this animal was observed in numerous herds near the western extremity of Lake Aral by Major James Abbott, who remarks that he “ascended some high land covered with snow. Wind scarcely endurable. We every day see herds of wild Asses, and flocks of the Saiga Antelope. I counted 800 wild Asses in a single herd.”† According to Lieut. Irwin, it is “common in Persia, the western parts of Khorassân, and the plains of Turkistân, from which he extends north into the Russian dominions and the centre of Asia. A few are kept by the Ymacks more for curiosity than use.”‡ Southward, they are still numerous in the parched and rugged deserts of Beluchistân, which however are scarcely hotter than the country about the Aral in summer: there are many of them in the *Pât* or desert between Asni and the hills, west of the Indus, above Mithur-kote. “In this desert,” remarks a recent writer, “they are to be found wandering pretty well throughout the year; but in the early summer, when the grass and the water in the pools have dried up from the hot winds (which are here terrific), the greater number, if not all, of the *Ghor-khurs* migrate to the hills for grass and water. Some are probably to be found in

\* *Vide* a subsequent notice of the *Ghor-khur*, p. 240, where individuals are noticed of a very dark colour! But the *Dshiggetai*, as described by Pallas and Pennant, does not quite satisfactorily agree in colouring with the Tibetan *Kyang*! “Le poil est d’un jaune rembruni, assez clair. Le nez et l’intérieur des membres sont d’un jaune roux.” (Pallas, *Voyage*.) Pennant also, translating from the German, writes—“The colour of the upper-parts of the body a light yellowish-grey, growing paler towards the sides. *Buttocks white*, as are the inside of the limbs and belly.” This colouring really applies better to the *Ghor-khur*.

† ‘Narrative of a Journey from Herat to Khiva,’ &c. I, 23.

‡ J. A. S. VIII, 1008.

the hills throughout the year, for among them are sandy plains of greater or less extent. The foaling season is in June, July, and August; when the Beluchis ride down and catch numbers of foals, finding a ready sale in the cantonments for them, as they are taken down on speculation to Hindustan. They also shoot great numbers of full grown ones for food, the ground in places in the desert being very favorable for stalking. \* \* \* Some are beautifully striped on the legs; many are mottled. *I have seen one or two of a very dark colour.* They have not generally the stripe on the shoulder, though I think I have seen some with it slightly marked.”\* Eastward of the Indus, this animal appears to be fast verging on extermination; and I am assured that one herd only is left in the Bikánir desert, where the foals are often run down, and Major Tytler’s specimens are from this locality. There are still a few also in the Runn of Cutch.† “The wild Ass of Cutch and the north of Guzrât,” remarked Col. Sykes in 1835, “is not found further south in India than Deesa, on the banks of the Bunnas river in lat. about 23° 30’; nor have I heard of it to the eastward of the 75° of longitude on the southern side of the Himalaya. In Cutch and northern Guzrât it frequents the salt deserts and the open plains of the Opur, Jaysulmir, and Bikánir.” Again, Masson, in his ‘Narrative

\* *India Sporting Review*, n. s. III, 172.

† From information obtained by Major Tytler, it appears that the Bikánir herd consists at most of 150 individuals, which frequent an oasis a little elevated above the surrounding desert, and commanding an extensive view around; the animals being exceedingly shy, and making off on discerning an object of suspicion however distant. There is a low range of hills several miles off, in which is a water-course dry during the hot season; but at the head of this, about a mile into the interior of the hills, there is a perpetual spring to which the *Ghor-khurs* resort to drink during the night, maintaining the most vigilant caution. Once only in the year, when the foals are young, a party of five or six native hunters, mounted on hardy Sindh mares, chase down as many foals as they can succeed in tiring, which lie down when utterly fatigued and suffer themselves to be bound and carried off. In general they refuse sustenance at first, and about one-third only of those taken are reared; but these command high prices and find a ready sale with the native princes. The profits are shared by the party, who do not attempt a second chase in the same year, lest they should scare the herd from the district, as these men regard the sale of a few *Ghor-khurs* annually as a regular source of subsistence.

of a Journey to Kalât, (published in 1843), remarks that "the *Ghur-khor*, or 'wild Ass,' was formerly to be found on the Dasht Gúrân, and in Ghurgh'ina, but has disappeared of late years. It is still occasionally seen about Khârân. It also ranges the plain of Dâlbanding, on the road from Núshké to Jálk. South-easterly of Kalât, it is said to be found on the Pât of Shikárpúr, between Tam-bú and Rojân."

To the west of the range of the *Ghor-khur* lies that of *ASINUS HEMIPPUS*, or true *Hemionus* of ancient writers,—the particular species apostrophized in the book of Job, and again that noticed by Xenophon. There is a recent account of it by Dr. A. H. Layard, in 'Nineveh and its Remains' (324). Returning from the Sinjar, he was riding through the desert to Tel Afer, and there he mistook a troop of them for a body of Horse, with the Bedouin riders concealed! "The reader will remember," he adds, "that Xenophon mentions these beautiful animals, which he must have seen during his march over these very plains. He faithfully describes the country, and the quadrupeds and birds that inhabit it, as they are to this day, except that the Ostrich is not now to be found so far north.\* 'The country,' says he, 'was a plain throughout as even as the sea, and full of wormwood; if any other kind of shrubs or reeds grew there, they had all an aromatic smell; but no trees appeared. Of wild creatures, the most numerous were wild Asses, and not a few Ostriches, besides Bustards, and Red Deer (Gazelles), which our horsemen sometimes chased. The Asses, when they were pursued,

\* According to Chesney, Ostriches are still "found in the great Syrian desert, especially in the plain extending from the Haouran towards Jebel Shammar and Nedja: some of them are found in the Haouran itself; and a few are taken almost every year, even within two days' journey of Damascus," &c. (*Journal of Euphrates Expedition*, I, 558.) It is well known that Ostriches commonly accompany, at the present day, the troops of Quaggas and of Dauws in S. Africa.

The remnant of the Ostrich race in Syria requires close examination. From some eggs in Major Tytler's possession, I am strongly inclined to suspect a second species of Ostrich. These eggs are smaller than the ordinary Ostrich egg, and have a much smoother and more polished surface, with the pores scarcely perceptible. In the ordinary Ostrich egg, the pores are particularly conspicuous.

Ostrich feathers, whithersoever obtained, are numerous among the Kurds, who adorn their spears with them.

having gained ground on the Horses, stood still (for they exceeded them much in speed); and when these came up with them, they did the same thing again; so that our horsemen could take them by no other means than by dividing themselves into relays, and succeeding one another in the chace. The flesh of those that were taken was like that of Red Deer, but more tender.' (*Anab.* l. 1 c. 5.) In fleetness," continues Dr. Layard, "they equal the GAZELLE; and to overtake them is a feat which only one or two of the most celebrated mares have been known to accomplish. The Arabs sometimes catch the foals during the spring, and bring them up with milk in their tents. They are of a light fawn-colour—almost pink. The Arabs still eat their flesh." This will of course be the animal seen by Mr. Ainsworth at the foot of Taurus, and observed by him among the lower hills.\*

It cannot be doubted that this *ASINUS HEMIPPUS* is the Mesopotamian and Arabian 'wild Horse' of Col. Chesney, as distinguished from his 'wild Ass' of the southern deserts of Arabia. In Mesopotamia, this author remarks—"We did not obtain a single specimen, although the Arabs engaged to bring one: they brought a skin, however, of a light brown colour, without stripes, and having a mane [! dark streak?] all along its back. This is more probably the wild Horse."!!! Again, treating on the animals of Arabia, he remarks—"The wild Horse, the wild Dog [? *LYCAON PICTUS*?], and a kind of wild Cow [*ORYX BEATRICIS* (?), Gray], inhabit the country adjoining the district of Joff, between Tolink Sanou and Kedrush; and to the south of these places the wild Ass [*ASINUS VULGARIS*?] is found in great numbers. The Sherarát Arabs hunt them, and eat their flesh, but not before strangers." Elsewhere he remarks that—"The Ass is probably the original animal of its kind [*i. e.* *species* domesticated?] in the country; for it is first mentioned in connexion with this part of the world (*Gen.* xii, 16, *Exod.* iv. 20), and it was afterwards considered as a royal animal."† Here

\* 'Travels in Assyria, Babylonia, and Chaldea,' p. III.

† Col. C. H. Smith remarks that the Ass is "repeatedly mentioned in the Pentateuch before the Horse is noticed, such as, in the sacrifice of Abraham; in his visit to Egypt, where he received presents from Abimelech; and in the spoils of Shechem, where Asses are mentioned with other cattle, but the Horse is not men-

at least two species are indicated, which are likely to be the *ASINUS HEMIPPUS* and genuine *A. VULGARIS* in its aboriginally wild state; and the wild Asses of the island of Socotra may be presumed to be no other than the latter. They are noticed by the late Lieut. Wellsted, R. N., who remarks—"Amidst the hills over Tamarida, and upon the plain contiguous to it, there are a great number of Asses, which were described to me as different from the domestic Ass; but after repeated opportunities of observing them, I could find no reason for such a distinction. The introduction of Camels," he remarks, "having superseded the necessity of employing them as beasts of burthen, they are permitted to stray where they please, and now wander about in troops of ten or twelve, evincing little fear unless approached very near, when they dart away with much rapidity." It is more likely that they are truly aboriginal.

The genuine wild Ass would, however, appear to be chiefly an inhabitant of N. E. Africa, where considerable troops of these animals still exist, as described by ancient authors; and being of pre-historical antiquity, it does not appear upon what grounds the late Prince of Canino pronounced them to be the descendants of domestic Donkeys, like those (for certain) in the hotter parts only of America: for it may be remarked that it is only in a hot climate that the Ass has returned to wildness,\* and the domestic Ass is said to thrive only in a warm climate, and to be reared with difficulty even in Norway. To this subject, however, I propose to return in the sequel.

Whether or not inhabiting the southern parts of the peninsula of Arabia (which our friends at Aden should endeavour to ascertain.) The Horse is supposed to have been introduced into Egypt by the *Hyksos*. In Assyria it was reclaimed at the period of the oldest monuments, as abundantly demonstrated by the discoveries of Layard and others—since Col. Smith wrote.

\* Azara notices, of those which have gone wild in South America, and especially about Santa Fé de la Vera Cruz, where he states that the increasing population was fast destroying them (and may have done so by this time), that those which he saw "appeared to be somewhat larger than the domestic Asses of Paraguay, but smaller than the common Asses of Spain; nor does that large race," he adds, "which is there used for the breeding of mules, exist in these parts. They also appear to have larger and stiffer ears than in my native country."

tain) and also the island of Socotra, it is quite certain\* that great troops of wild Asses, properly so called, exist not only in the sandy deserts but upon the mountains of N. E. Africa. And it appears that a specimen was not long ago added to the Paris Museum, and was there designated "*l'Onagre d'Abyssinie*:" it was presented by M. Degoutin, French Consul at Massoua, and (remarks Professor Isidore St. Hilaire) "*est certainement un Ane sauvage*." It belonged, he tells us, to one of those troops which wander about the deserts of N. E. Africa, the existence of which was long ago indicated by Ælian, and which are mentioned also by Leo Africanus in the sixteenth century, and by Marmol in the eighteenth century.

"The wild Ass, remarks the latter author, is grey. There are a number of them in the deserts of Lybia, Numidia, and the neighbouring countries. Their pace is so fleet, that only a Barb can come up with them. In our days," continues M. St. Hilaire, "these troops have been met with in various localities by different travellers; among others, by M. Caillaud, in Nubia; and to all the testimony already published, may be added '*trois documents inédits*,' respectively by M. Botta (formerly travelling naturalist for the Paris museum and now Consul at Jerusalem), by M. Trémaux (architect), and by M. Gouzillot (Coptic Patriarch in Abyssinia).

"The first observed, in Sennaar, a multitude of wild Asses in troops, which were very distinct, according to the spoils obtained, from other animals designated wild Horses [*A. HEMIPPUS?*], which inhabit the opposite coast of the Red Sea, in Arabia. The second, in 1848, remarked them in the desert of Naga, in Nubia: their coat was of a palish grey, and the ears were longer than those of the Hemione [*A. HEMIPPUS?*], but shorter than in the tame Ass [*?*]. Lastly, M. Gouzillot, who passed six years in Abyssinia, has assured us of the existence of Onagers in countless herds on the mountains."

These are of course the wild Asses noticed by Col. C. Hamilton Smith, as occurring "on the Nile, above the cataracts; and abundant on the upland plains, between the table-hills below Gous Regun and the Baber-el-Abiad, in Atbara. (*Vide* '*Voyage on the Baber-el-Abiad*,' by Adolph, Linaud, and Hoskins's '*Travels in Ethio-*

\* *Jour. Roy. Geogr. Soc.* 1835, p. 202.

pia.')

 According also to Sir J. Gardner Wilkinson, they are "common in the districts of the Thebaid."\* Hoskins met with them in the small desert immediately below the fifth cataract. "This desert," he remarks, "is sandy, with quartz and flinty slate disseminated. We saw for the first time three wild Asses, which had been browsing among the acacias near the Nile. There are great numbers of them in the country; but the peasants very seldom succeed in catching or destroying them. A mixed breed [1] is sometimes seen in the villages. From the description of the Arabs, I conceive that the Zebra [A. BURCHELLII], also, exists in these deserts. The Nile Ass seems larger than the common one; but we were at too great a distance to observe them particularly. The peasants seldom chase them, but with a good Horse it is not very difficult."†

Both "wild Asses" and "Zebras" are noticed by Mr. W. C. Kirk, in his 'Report on the Route from Tajurra to Ankobar.'‡ Ruppell has determined this northern Zebra to be the A. BURCHELLII, or Dauw of the Cape colonists,—the *Equus zebra* of Burchell, as distinguished from his *E. montanus*,—and undoubtedly the true *Hippotigris* of the ancients, if not also the original 'Zebra' of Pigafetta from Congo:§ the *wild-Paard* of the Dutch colonists, or 'Mountain Zebra' of Burchell, being the EQUUS or ASINUS ZEBRA of modern technical nomenclature. This I mention, because the French zoologists, from Cuvier to M. Isidore St. Hilaire,|| persist in the mistake of identifying the "Zebra de montaigne" with the Dauw or A. BURCHELLII.

Bruce notices "Zebras" as being "found in Abyssinia only in the south-west extremity of Kuora amid the Shangalla and Galla, in Narea and Caff, and in the mountains of Dyre and Tegla, and thence to the southward."—"Wild Asses," too, he remarks, "I

\* 'Domestic Manners of the Ancient Egyptians,' III, 21.

† 'Travels in Ethiopia,' p. 41.

‡ *Journ. Roy. Geogr. Soc.* XII, 234; and for another notice of an African wild Ass, *ibid.* X, 461. In the narrative of Lander's expedition (p. 571), a "wild Ass," is mentioned, whatever this may refer to.

§ Col. C. H. Smith considers this northern 'Zebra' to be distinct, and styles it *Hippotigris antiquorum*; but I think on very insufficient evidence.

|| *Comptes Rendus*, 1855, p. 1215.

have frequently seen alive, but never dead : in neck, head, face, and tail, very like ours, *only their skins are streaked*, not spotted!" Perhaps he alludes to occasional bars on the limbs, like the wavy lines on those of the *Ghor-khur* which Bell seems also to refer to. The wild Ass of N. Africa is not mentioned in Dr. Barth's work ; but at the Meeting of the British Association for 1858, Mr. R. Schlagintweit made some remarks relative to the *Ghor-khur* (as reported in the *Athenæum*), and stated that Dr. Barth had lately told him, that, according to the description which he (Mr. R. Schlagintweit) had given him, "he thinks the Asses which he saw in Africa identical with the *Ghor-khurs* of Sindh and Beluchistan." This can hardly be ; and does the following notice refer to the ordinary wild Ass of N. E. Africa ? I very strongly suspect otherwise. Col. C. H. Smith remarks—"We have seen a pair of these animals brought from Cádiz ; they were equal in size to an ordinary mule, neatly if not elegantly formed, *white* in colour, but silvery-grey on the ridge of the back and nose, with the forehead, neck, and sides of a beautiful pale ash with a tinge of purple, the mane, tail, and cruciform streak black."\*

These I take to be choice specimens of the fine Levantine breed of domestic Asses, such as are often represented in antique Egyptian paintings, and always with the black crucial mark. From the remotest times, it seems that two races of domestic Asses were known in Egypt, and both are represented in the old paintings. In modern times, Russell (in his 'Natural History of Aleppo,' p. 58,) remarks, that the Levantine nations have two principal breeds of Asses ; "one very large, with remarkably long ears ; the other small, and much like ours in England." Chardin, again, tells us, that there are two races of the domestic Ass in Persia : "Les Anes du pais, qui sont lents et pesans, comme les Anes de nos pais, dont ils ne se servent qu'à porter des fardeaux ; et une race d'Anes d'Arabie, qui sont de fort jolies bêtes, et les premiers Anes du monde. Ils ont le poil poli, la tête haute, les pieds légers, les levant avec action en marchant. L'on ne s'en sert que pour montures : les selles qu'on leur met sont comme des bâts ronds, et plats hardessus, faites des drap ou de tapisserie, avec les étriers et le harnois. On s'assied

\* Naturalist's Library, 'XII, 312.



dessus plus vers la croupe que vers le cou. On met à plusieurs des harnois tout argent, tant le maître est content de la légèreté et de la douceur de leur allure. Il y en a du prix de quatre-cens francs, et l'on n'en sauroit avoir d'un peu bons à moins de vingt-cinq pistoles. On les panse comme les chevaux. Les ecclésiastiques d'qui ne sont pas encore dans les charges, ou dans les grands Bénéfices, affectent à aller montés sur les Anes." He then proceeds to explain how these fine Asses are taught to amble.

The large and small races of Levantine Asses may be said to bear somewhat of the same mutual relation as Horses and Ponies. The small kind only have become domesticated in Northern Europe; and we trace them southward into Dârfur, where they are thus described in Mr. G. Brown's Travels in that country (1799).—"The Ass here is of the same appearance and of the same indocile nature, as that of Great Britain. The only good ones are what the Jelabs bring with them from Egypt: yet the animal is much used for riding; indeed few persons mount a Horse but the military, and those who are in immediate attendance at Court. An Egyptian Ass fetches from the value of one to that of three slaves, according to the weight he is able to bear. A slave will purchase three or four of the ordinary breed; and yet the people are not anxious to improve them."

The Asses of Upper Egypt, according to Sounini, are particularly handsome, but they degenerate towards the Delta. Fraser states, that the Asses of Omân are the best in Arabia, and individuals of the best breeds sell for extravagant prices.\* In Munro's *Syria*, we are told that the Asses of Damascus stand fourteen hands high; and elsewhere he remarks of one of them:—"This Ass was the finest of the kind I ever saw, and the guide asserted that he would sell for more than both his own Horses. With all the animation and temper of a Horse, he had the superior qualification of being quicker and easier in his walk."—"This Ass was found, after a long journey, to refuse his food. On visiting him, after supper, I found

\* I have somewhere read that the pedigrees of the best Asses of Omân are kept with as much care as those of the choicest breeds of Horses in the same province.

that the Ass was not eating, and seemed out of spirits. The guide accounted for this by saying, that he was in the habit of living in the house with his master, and that he was alarmed at being left in the dark by himself; wherefore I ordered him into the shed, and his supper being placed near the fire, he fell upon it with great avidity; and had no sooner finished, than he claimed a right to belong to the society, by lying down amongst us, to my great amusement, and the infinite chagrin of my companions, who would have turned him out but for my interference. During the night he became restless, and got up in order to lie down on his other side; in doing which he interfered with the guide's legs, whom I found abusing him for being a pig and an infidel, and threatening to spit on his beard."

In Irwin's '*Memoir of Afghánistán*,' we are informed that "the Ass gradually improves as we proceed westward from the Company's provinces. Perhaps the best are those from the west of Khorassán, but even these are much inferior to the Arabian or the Spanish. Asses are imported from Kábul into Bokhára, and the north-west of Turkistán." Buckingham tells us, that "one of the peculiarities of Bághdád is its race of white Asses, which, as at Cáiro, are saddled and bridled for the conveyance of passengers from one part of the town to another; and these are equally as large and spirited as the Egyptian Ass, and have as easy and speedy a pace. They are frequently spotted over with colours, and otherwise fantastically marked over with red henna-stains." This barbarism, it need not be told to Indian readers, is commonly practised on Horses in this country.

At Pesháwar, tame Asses of the large race are known as '*Bokhára Asses*'; and Sir A. Burnes, writing on the domestic animals of Bokhára, remarks—"none are more useful than the Ass; the breed is large and sturdy, and they are much used—both for saddle and bridle. There is no objection to riding them, as in India. There are no mules, from a religious prejudice against them." His brother, Dr. A. Burnes, also remarks that—"Asses, much larger than those of India, are to be met with in Sindh, where the Ass attains the development which it is known to enjoy only within a very limited geographical distribution." But are not these fine Asses chiefly

imported into Sindh, rather than bred there? Albeit the climate should well agree with them. A correspondent informs me, that "what are called Bokhára Asses are frequently brought to Pesháwar. They are very large and strong, and are both of the usual colour and white. Of the latter, a friend of mine had three, viz. a male and female, and their offspring. There was one of the usual colour, larger than either of the two white ones, and I have some idea that I had heard it said that he was over thirteen hands high; but of this I will not be positive, having paid no great attention. I think they were not at all uncommon at Pesháwar when the Káfilas were getting through, and, as far as I remember, the price asked for one was from 80 to 150 rupees. As for where they came from, that I don't know in particular, except that they came with the Káfilas of Horses from the north. The dark one I have mentioned was an extremely fine specimen; but my friend got him for (I think) 80 rupees, to use as a baggage Donkey, and as far as I recollect he was sold cheap, because he declined to act as a stallion to *mares*, and was therefore useless for the purpose of begetting mules." It would appear, accordingly, that these fine Asses are foreign to Sindh, and are mostly brought for the purpose of procreating mules; in which case she-Asses of the kind are probably scarcely known there, and consequently the race can hardly be said to be introduced into the country. It would nevertheless appear to be completely naturalized in Bokhára.

These superb Asses are bred and duly estimated in America; and it is time that they were introduced into the Australian colonies, if not also those of S. Africa. In Capt. Marryatt's well known 'Diary in America,' the novelist describes a cattle-shew which he attended in Lexington, Kentucky. The fourth day of the shew was reserved for the exhibition of Asses. "Several were shewn standing fifteen hands high, with head and ears in proportion: the breed has been obtained from the Maltese Ass, crossed by those of Spain and the south of France. Those imported, seldom average more than fourteen hands high; but the Kentuckians, by great attention and care, have raised them up to fifteen hands, and sometimes even to sixteen. The prices paid for these splendid animals, for such they really are, will prove how much they were in request.

One male, of great celebrity, sold for 5,000 dollars, upwards of £1,000 sterling. A half share of another male was sold for 2,500 dollars. At the shew I asked the price of a very beautiful female Ass, only one year old; the owner said that he could have 1000 dollars for her, but that he had refused that sum. For a three year old male, shewn during the exhibition, 3,000 dollars (more than £600) were refused. The fact is that mule-breeding is so lucrative, that there is no price which a very large Donkey will not command."

With reference to the current statement, that the Ass nowhere thrives in a cold climate, it should be remembered that these animals are numerous in Pekin; and that some at least of the Chinese Donkeys are fine animals, may be inferred from Dr. Hooker's remark about the Tibetan mules, which, he says, are often as fine as the Spanish. He "rode one, which had performed a journey from Choombi to Lhasa in fifteen days with a man and load." Nevertheless, as a general rule and irrespective of recent introductions, the finest Asses chiefly inhabit Arabia and the Levantine countries, and the most degenerate are the puny cat-hammed *Guddhas* of India generally. As Col. Sykes remarks, some of these are scarcely larger than a fine Newfoundland Dog; but on what ground Col. C. H. Smith supposed this to be a wild race inhabiting the Dukhun,\* it is difficult to imagine. There are small Asses also in Persia, as about Ispahán, what Chardin (as we have seen) denominated the race proper to the country; while he mentions that many of the large kind are imported into Persia from Arabia. It is curious that Aristotle states, that in his time there were no Asses in Pontus, Syria, or in the country of the Celts (meaning modern Germany and France); Syria being now so celebrated for the excellence of its breed of them. For many ages previously they are known to have existed in Egypt and Arabia. In short, there seems to be no evidence whatever to bear out the current notion that the domestic Ass originated in northern Asia; but, on the contrary, every reason to infer that it originated in the region where the particular species is still found wild, and where also the finest and least altered of the domestic races prevail to this day; and that the fact should not have been long ago established, is surely somewhat remarkable.

\* *Nat. Libr. Mammalia*, Vol. XII, 306.

A writer on this animal observes, justly enough, that—"The Ass is, properly speaking, a mountain species; his hoofs are long, and furnished with extremely sharp rims, leaving a hollow in the centre, by which means he is enabled to tread with more security on the steep and slippery sides of precipices. The hoof of the Horse, on the contrary, is round and nearly flat underneath, and we accordingly find that he is more serviceable in level countries; and indeed experience has long since taught, that he is altogether unfit for crossing rocky and steep mountains." Hill ponies may, indeed, be cited as exceptions, to a greater or less extent: but the fact is nevertheless true in the main; and hence the breeding of mules in mountainous countries, which should combine the size and strength of one parent species with the hardihood and sure-footedness of the other. All of the Asinine tribe seem to be quite indifferent to heat, and some (at least) of them are equally so to cold, as especially exemplified by the *Koulans* or *Ghor-khurs* about Lake Aral; and the tame Asses of this country, under the fiercest mid-day sun, may commonly be observed to evince their innate fondness for the parched desert, as strongly as a kid manifests its propensity to clamber rocks, by keeping to the dusty roads, in preference to the pasture, whenever they are not feeding. Of several species so very nearly akin, in different countries, it is remarkable that only the Ass should have been subjected to servitude (save in a few individual cases at most); but it appears that the experiments which have been systematically carried on, now for several years, by the Acclimation Society at Paris, have been attended with considerable success in breaking in *Ghor-khurs*, which have been bred there for a series of generations, and that these animals are now daily mounted and ridden. Many years ago, the celebrated Sheriff Perkins drove a pair of Quaggas through the streets of London, as I well remember to have witnessed when a child.

The following species of the division *ASINUS*, as defined by Gray, are now likely to be generally acknowledged.

1. *A. QUAGGA*. The Quagga, from the Cape territories; and scarcely found northward of the Gariep or Orange river; but still in great herds southward, associating with the White-tailed Gnu, as the next does with the Brindled Gnu, and both with Ostriches (as in Xenophon's

time the *A. HEMIPPUS* did in Mesopotamia). The most Horse-like in structure of any. The *Hippotigris isabellinus* of Col. C. H. Smith is probably founded on a Quagga-foal, perhaps not very exactly represented. Such an animal as this, or as the 'Isabelline Zebra' of Levaillant, could not have been overlooked by all subsequent explorers of S. Africa.

2. *A. BURCHELLII*, Gray; *Equus zebra* of Burchell. The *Dauw*, or original *Hippotigris* of the ancients, and also the original *Zebra* of Pigafetta from Congo; but unknown to Buffon, who regarded the next or Mountain Zebra and the Quagga as the two sexes of one species, denominated by him the Zebra: *Hippotigris Burchellii* et *H. antiquorum* of C. H. Smith. Extensively diffused over Africa, even to Abyssinia and to Congo, and southward to the Gariep river.\*

3. *A. ZEBRA*: *Equus montanus*, Burchell. The Zebra of modern nomenclature, or (more distinctively) the Mountain Zebra; *Wild Paard* ('Wild Horse') of the Dutch colonists of S. Africa. A thorough mountaineer, and known only to inhabit S. Africa. Also the most completely striped of any, down to the very hoofs.

4. *A. VULGARIS*, Gray: *E. asinus*, L. The true *Onager*, *Onagrus*, or aboriginally wild Ass; indigenous to N. E. Africa, if not also to the southern parts of Arabia and island of Socotra.

5. *A. HEMIPPUS*: *E. hemippus*, Is. St. Hilaire; *E. asinus onager* apud Wagner. The *Hemionus* vel *Hemippus* of the ancients; inhabiting the deserts of Syria, Mesopotamia, and the northern parts of Arabia.

6. *A. ONAGER*: *E. asinus onager*, Pallas. The Koulan or Ghor-khur inhabits W. Asia, from 48° N. latitude southward to Persia, Beluchistan, and W. India.

7. *A. HEMIONUS*; *E. hemionus*, Pallas: *E. kyang*, Moorcroft; *E. polyodon*, Hodgson. The Dshiggetai or Kyang. Inhabits Tibet, and thence northward through the Gobi desert into Mongolia and southern Siberia.

*N. B.*—So far as known for certain, the last two are distinguishable by shades of colour only, and by unimportant differences in the relative extension of different hues and markings. The *A. hamar*

\* To this species appertained the 'Zebra' lately subjected by Mr. Rarey.

of Col. C. H. Smith is rejected, as having been founded on insufficient evidence of the existence of such an animal.

It is highly improbable, also, that other wild asinine species yet remain to be distinguished.

To recapitulate, I have endeavoured in this paper to establish the following novel propositions.

1. That the true *Onager* and *Hemionus* of ancient writers were unknown to Pallas, who has assigned those names to cognate species or races that were unknown to the Greeks and Romans.

2. That, accordingly, the *Koulán* of N. Asia is not the true *Onager* or aboriginal wild Ass, but that it is identical with the Indian *Ghor-khur*.

3. That the true *Onager* or wild Ass is not an inhabitant of N. Asia, but of N. E. Africa and the southern portion of Arabia.

4. That the *Koulán* and the *Dshiggetai* or *Kyang*, instead of being strongly distinguished apart, as has been asserted, bear so exceedingly close a resemblance that no decided specific distinction has yet been satisfactorily pointed out, however probable that such distinction may exist.

Why, therefore, the one should be popularly styled a 'wild Horse,' and the other a 'wild Ass,' is difficult to comprehend. Even Pallas terms the *Dshiggetai* "un Cheval sauvage," though describing it as "ni Cheval ni Ane,"—while the other he both designates as the Ass of the steppes and as the "Cheval ou Ane," employing the word 'Cheval' in its German equivalent evidently in the sense of *EQUUS*. Col. Chesney, as we have seen, terms the Arabian A. *HEMIPPUS* a 'wild Horse,' as distinguished from his wild Ass of S. Arabia! The fact is, I apprehend, that the vague application of these names has resulted merely from the colouring.

*April 18th, 1859.*

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PROCEEDINGS  
OF THE  
ASIATIC SOCIETY OF BENGAL,

FOR JUNE, 1859.

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The Monthly General Meeting of the Asiatic Society of Bengal was held on the 1st Instant.

A. Grote, Esq., President, in the Chair.

The proceedings of the last meeting were read and confirmed.

*Presentations were received.*

1. From Lieut.-Col. James Abbott, through W. H. Fergusson, Esq., two boxes of ancient copper coins.

2. From Major Berdmore, Schue Gyen, on the Sitang River, Tenasserim Provinces, a collection of reptiles and fishes, chiefly the latter, obtained mostly from the hills in the interior, and comprising some new generic forms of much interest, with several new species belonging to other mountain forms of India.

3. From Capt. Hodge, through A. Grote, Esq., a bottle of specimens preserved in spirits from Port Blair.

4. From the Home Department, Nos. 53 A and 55, of the Selections from the records of the Madras Government.

5. From Dr. E. Roer and W. A. Montriou, Esq., copy of a work on Hindu Law and Judicature from the Dharma Sastra of Yajnavalkya.

6. From F. E. Hall, Esq., M. A., a work entitled "A Contribution towards an Index to the Bibliography of the Indian Philosophical Systems."

Major R. Tytler, duly proposed at the last meeting, was balloted for and elected an ordinary member.

R. H. M. Warrand, Esq., B. C. S., proposed by Mr. Atkinson, seconded by Mr. Grote, was named for ballot at the next meeting.



*Communications were received.*

1. From G. H. Freeling, Esq., An account of Pergunnah Mahoba, Zillah Hameerpore, Bundelkund.

2. The following extract from a letter dated Aden, April 16, 1859, addressed to Mr. Blyth by Captain Speke, who has lately returned with Capt. Burton from an exploring journey in the East of Africa :

“At last we have returned from our African exploration and I think with tolerable success, considering all things. Starting from just opposite Zanzibar we travelled over flattish cultivated and tree-clad ground, following up the Kinjani river to the Eastern Ghauts of Africa about 100 miles from the Sea. Thence we ascended from 250 feet and crossed over the mountain belts, averaging from 2000 to 6,000 feet each, until the great central plateau was reached. These hills are chiefly composed of granite and are very sparsely populated excepting in some few favoured places. Their breadth is about 2 degrees. Still travelling Westward on the parallel of Zanzibar, the track extends about 6 degrees over a continuous plateau, dotted, and in some places striped, with small hills, outcrops of granite, until the great and extraordinarily depressed Lake Tanganzika is reached. This is a lovely piece of water surrounded on the Northern half, where we visited it, by a nest of hills higher to the north, and gradually drooping towards the South, thickly studded with a population of boisterous habits. The water level is only 1,800 feet or about half the height of the plateau. Some of the fishes are excellent. I have brought away some specimens of shells. There is but a limited variety of them. The Lake water is very sweet and good.

“On returning from the Tanganzika Lake I left my companion (who had been almost in a bed-ridden state from the beginning of the journey) at a place called Unzunzember, Lat. 5° S. and Long. 33° E., and went due North up the plateau to 2° S. There I discovered the water of waters, the Nyanza Lake, a broad expansive sheet at an elevation of 3800 feet, extending *certainly* 5° or 6° to the northward and about 90 miles broad. The waters are delicious and are said to contain a great variety of fish. The whole of its southern extremity is thickly populated, thickly cattled, and thickly

cultivated. Iron is found in great abundance, and a little north of the Line coffee is grown to any extent. By my observations and from the inability to get any information of a termination to the Lake northwards, coupled with a story generally known amongst the Somali of Aden that a large sheet of water exists to the westward of their country, there remains in my mind little doubt but that I have discovered the true source of the Nile. How I long to go back there and finish the work begun by a Bengali. Cotton and rice grow very well over the plateau, but the people are too inert to make any good of it. Frankincense and other gums are abundant in places. The people of inner Africa are generally speaking mild savages. I was very much disgusted with the great paucity of game, and animal life generally is not at all what I expected to see. As my companion had a handy servant who could shoot, and stuff too after I taught him, I did not interfere in the zoological department but left it to him.

"Perhaps you remember taking me to the Surveyor General's, where I showed him my maiden map, a sketch of little Thibet, drawn with the aid of a common compass, and a five pound watch. I have now done all the mapping in Africa, that has been my especial province, but this time I have done it astronomically."

3. The following letter addressed to the Secretary, Mr. Atkinson, from Dr. W. Haidinger of the Imperial Museum of Geology and Mineralogy in Vienna.

MY DEAR SIR,—I beg leave to address you like an old correspondent, though it be the first letter I write you. I should observe however that it is already the second, the first official one having been sent along with the new numbers of our "*Jahrbuch*" for the Asiatic Society of Bengal, along with the acknowledgment of the receipt of that most welcome and highly valuable set of publications, you kindly sent over to us through Messrs. Williams and Norgate, and which came safely to our hands. But I wish to propose to you and the Museum of the Society in the name of our Imperial Museum of Mineralogy, a measure of exchange which I trust, as well as Dr. Hörnes, Director of that Museum, may be advantageous both to our Museum and to the one under your charge. I enclose in the first place the list of meteorites and meteoric irons in our

Imperial Vienna Collection. If you compare it with Mr. H. Piddington's Catalogue of the Meteorites preserved in the Museum of the Asiatic Society, published in 1844, Vol. XIII. No. CLV., N. S. 71, page 885, you will find that we possess none at all of those mentioned in your Catalogue, and that in your Catalogue also none is mentioned of those preserved in ours, if we except the Pallas iron of Siberia and the Mornay Iron of Sergipe in your Catalogue, which are the same as No. 94, Krasnojarsk, and No. 104, Bahia, of ours. Now we propose a fair exchange. Probably since 1st of January, 1845, your collection may have been considerably enlarged. I would therefore be very much obliged to you in the first place, if you would kindly communicate to me a catalogue of the Meteorites and Meteoric iron, at present in your Museum. To state the *number* and *weight* of specimens, would be most interesting in this catalogue. Then we should be obliged, and very much obliged indeed, for your communicating to us specimens, either fragments or entire masses, where you possess several of the same fall. If in some case or other there should not have been any chemical analysis published, I should be most happy not only to give a new description of the Meteoric stone or iron mass, but also to get an excellent new analysis performed. I should be particularly happy, to receive from you any information, additional to what is published in your journal respecting the fall or other history of the specimens.

The box containing the specimens might be sent with the Overland Mail, directed to "Kaiserlich-Königliche Geologische Reichsanstalt Wien" with the declaration "Mineralogical Specimens." If you would send specimens for examination, like for instance No. 4 of the Meteoric Irons, the Fulgur Stone of Nepal, "not examined, perhaps meteoric" I should be glad to undertake the examination, and then return the specimen, if you did not entitle me to keep perhaps a portion of it for our own collection of Meteorites. I should be glad also to get a portion of your Kurruckpore iron. But there is the difficulty of cutting off a portion of it. It never should be treated with a hammer. This spoils the structure altogether. I should advise you to get a portion sawed off in the direction here indicated making use of a steel seesaw without teeth, and

emery. With all that however it is a hard job, and a cut of perhaps five inches in every direction will take a continued work of perhaps six weeks, the meteoric irons being exceedingly tough. If you were to cut off in that way a lump of, say, ten or twelve pounds and send it over, we might have it cut afterwards in smaller specimens here, if you would send specimens also to one or another Museum in Europe.

Now I have said a great deal about what we wish you should do. But I must also say what we are ready to offer you as a fair exchange. The Imperial Vienna Museum would send you specimens of meteorites new to your cabinet or museum of several localities, of which there are duplicates, and there are such of a good many of them. If you should fix upon some one or other of them, we should do our best to have your wishes executed. I suppose the greater part of your Museum will have remained in the possession of the Society. Some Meteorites may be however also in the possession of the Museum of practical Geology, and I write also on behalf of the Meteorites to Mr. Oldham. I should be most happy to hear soon of your acceding to my proposition. I should have added, that on account of your most valuable present, we have entered on the list of our correspondents, your own honored name, as also that of the President, Hon'ble Sir James Colville, Vice-Presidents—Baboo Ramgopaul Ghose, A. Grote, Esq., Lieutenant-Colonel R. Strachey,—H. Piddington, Esq., E. B. Cowell, Esq., Baboo Rajendralal Mittra, Baboo Gour Doss Bysack; the writs of notification of which have been accluded to the package of our last numbers.

I have the honor, &c.,

(Sd.) W. HAIDINGER.

W. S. ATKINSON, Esq.,

*Secy., Asiatic Society of Bengal.*

With reference to this letter, the Council announced that they had appointed a Committee consisting of Mr. Oldham, Dr. Thomson, and Mr. Atkinson, to examine the meteorites in the Society's collections, and to report how far it was possible or desirable to comply with M. Haidinger's request. The Committee had presented a report which the Council had adopted, and they now requested authority to carry out the recommendations contained in it.

The report was as follows :—

Your Committee have taken the proposition conveyed in Dr. Haidinger's letter to the Secretary, into careful consideration, and beg to report on the question referred to them as follows.

It appears to your Committee highly desirable that the Asiatic Society of Bengal should, to the utmost of their power, reciprocate the friendly feeling and desire for co-operation evinced by the Imperial Cabinet of Mineralogy at Vienna. The collection of Meteorites in that establishment has for years past had a world-wide reputation, as being the most complete and valuable in existence, and has been long known to investigators of such interesting specimens by the valuable descriptions, &c. of Herr Partsch. Under the able superintendence of Dr. Hörnes this collection is steadily increasing in number. Your Committee think it not only a duty to endeavour to contribute towards bringing such a collection more nearly to completeness, but that the Society will also feel a pleasure in adding to so numerous and valuable a series which amounts at the present time to 137 varieties.

Under these impressions your Committee have carefully gone over all the specimens now in the possession of the Society. On the 1st January, 1845, Mr. Piddington gave a list of those at that time in the Society's collections, amounting altogether to 10 (*Jour. As. Society Bengal* Vol. XIII. p. 885.) One of these, the so-called Lightning stone of Nepal ("not examined, but may be meteoric" as described by Mr. Piddington) your Committee have agreed in thinking decidedly *not* meteoric. It is a fragment of stone very similar to those so well known in Great Britain, Norway, &c. to collectors of antiquities, as celts (or commonly called thunderbolts) or of a fulminating stone used by weavers for the preparation of their cloth.

To the number as given by Mr. Piddington in 1845 six varieties have since been added. A complete list therefore of those now in the possession of the Society would be as follows.

No. 1. Fell at Moradabad in 1808, procured from Captain Her-ring, 3 fragments. The total weight of these fragments is  $2\frac{1}{2}$  ounces.

No. 2. Aerolite which fell at Allahabad, sent by Dr. Tytler, of this there are three pieces of good size.

|          | lb.   | oz. |
|----------|-------|-----|
| Weighing | 3     | 8½  |
|          | 4     | 3   |
|          | 1     | 4½  |
|          | <hr/> |     |
| Total    | 9     | 0   |

No. 3. Aerolite which fell about 40 miles to the west of Umbala between the Jumna and Punjab in 1832-3, obtained by Captain Murray; given by Mr. J. Bird to Mr. Cracroft. Weight  $3\frac{1}{2}$  oz.

No. 4. Fell at Bithour and Shapur 75 miles N. W. of Allahabad on the 30th November, 1822.

Weight  $12\frac{1}{2}$  oz.

No. 5. Fell at Mow, Ghazeepore, February 1827, procured from R. Barlow, Esq.

Weight  $12\frac{1}{2}$  oz.

No. 6. Fell at Manegaon in Kandeish, July 1843, procured from Captain J. Abbott, Bengal Artillery, and J. Bell, Esq. Bombay Civil Service, Collector of Kandeish.

Weight  $2\frac{1}{2}$  oz.

No. 7. A very beautiful specimen, the locality of which is unknown, supposed to be from Assam: found by Mr. Piddington among the collections of the Coal and Iron Committee (Jour. As. Society Bengal Vol. XV. Proceedings June.) Of this there are two fragments which fit each other, and obviously form parts of the same meteorite. There is also a third fragment presenting the same general texture but not belonging to the same mass. This was found under the same circumstances and also among the collections of the Coal and Iron Committee.

The weight of these three fragments is as follows:—

|   |    | lb. | oz.            |
|---|----|-----|----------------|
| 1 | .. | 1   | $8\frac{3}{4}$ |
| 2 | .. |     | $8\frac{3}{4}$ |
| 3 | .. |     | $7\frac{1}{2}$ |

No. 8. The Meteorite which fell at Shalka, in Bancoorah, on the 30th November, 1850, described at length by Mr. Piddington in the Society's Journal Vol. XX. p. 299. Of this there are several fragments both large and small, weighing altogether about 9lbs.

No. 9. A very pretty little specimen which fell at Segowlee on the 4th (6th) March, 1853. Several others are stated to have fallen with this ; Jour. As. Soc. Bengal, 1854, Proceedings for November.

It weighs  $7\frac{1}{2}$  oz.

No. 10. Another specimen which fell at the same time as that just mentioned, and which was procured by the kindness of Mr. Glover, C. S. It is longer than the former, but less regular in form ; Jour. As. Soc. Bengal, 1855, p. 247.

It weighs 1lb.  $2\frac{1}{2}$  oz.

No. 11. A large meteorite, part of the same fall at Segowlee. At least thirty are said to have fallen. This weighs 14lbs. Jour. As. Soc. Bengal, 1856, p. 170.

*Meteoric Iron or Stones having a large proportion of it.*

No. 12. Meteoric stone containing Iron and Nickel, which fell at Pangoor in 1811 procured from Mr. Ross of Caddapah. Weight  $3\frac{1}{2}$  oz.

No. 13. Small fragment of meteoric Iron, from Siberia, procured by Pallas.

No. 14. Small piece of meteoric Iron from Sergipe, Brazil, Mor-nay and Wollaston.

No. 15. The large mass of Iron, described by Mr. Piddington at some length in Vol. XVII. P. II. p. 538 of the Society's Journal.

Weight of mass  $156\frac{1}{4}$  lbs.

Of these 15 varieties, your committee have to report that in their opinion specimens may, without injury to the Society's collections, be transmitted to the Vienna collection, of the following.

1st. Of the large mass of Kurrukpur Iron. They recommend that arrangements be made for having a portion of this mass sawn off. They believe that this will improve the specimen for the purposes of the Society's museum by shewing the internal structure of the mass (by much the most interesting feature in such irons) and which is not at present any where visible in the mass.

2d. Of the three specimens of the meteorite from Allahabad, communicated by Dr. Tytler, they recommend that one be sent to Vienna.

3d. Of the specimens presumed to be from Assam, they are of opinion that one could be sent without injury to the Society's Collection.

4th. Of the Shalka meteorite, of which there are numerous fragments, they recommend that a good specimen be sent.

5th. Of the large specimen from Segowlee, they would recommend that a cast be made to preserve a good record of the general form of the mass, which is peculiar, and that subsequently the smaller portion, at present loose, be transmitted to The Imperial Cabinet of Mineralogy at Vienna, together with a copy of the cast of the whole.

With reference to the liberal proposal of Dr. Haidinger on his own part, and that of Dr. Hörnes, they suggest that the anxious desire of the Society to possess any such additional varieties of the meteoric stones or Irons, as the Imperial Cabinet of mineralogy can provide, be communicated to Dr. Haidinger with an expression of the wish that he would select from their duplicates such specimens as, after examination of the Indian varieties forwarded, he might consider most illustrative of the nature of these interesting specimens.

Your Committee would direct your attention to the very cordial and friendly terms in which the application of the Imperial Museum of Mineralogy at Vienna has been conveyed, and feel confident that these feelings will be fully reciprocated.

Time has not permitted of their preparing any more detailed account of the structure, composition, &c. of the specimens referred to.

|          |                 |
|----------|-----------------|
| (Signed) | T. OLDHAM,      |
| „        | W. S. ATKINSON, |
| „        | T. THOMSON.     |

The recommendations of the Council were sanctioned and ordered to be carried out.

From Baboo Radhanauth Sikdar abstract of the results of the Hourly Meteorological Observations taken at the Surveyor General's office during the month of December last.

The Council reported that they had altered the hour of the general meeting from 8½ to 9 o'clock believing that the later hour would be more generally convenient, but that as some difference of opinion had been expressed on the matter, they desired to refer it to the decision of the members.

The meeting decided that the change was desirable during the hot weather.



Rev. J. Long read a paper entitled Notes and Queries on a visit to Orissa in 1859.

The thanks of the meeting were voted to Mr. Long for his interesting paper.

With reference to Mr. Long's suggestion that the Cuttack Hills should be examined by a Botanist, Mr. Samuells remarked that something had already been done in that direction by Lieut. Beddome of the 40th M. N. I. an accomplished Botanist, who, during his stay in Cuttack took every opportunity of adding to our botanical knowledge of this region. Mr. Samuells feared that Mr. Long's expectation of discovering antiquities in the Cuttack Hills would not be realised. He himself had traversed a considerable portion of them and had found no traces of ancient buildings. From the earliest notices we have of them, they appear always to have been inhabited by a poor and semi-barbarous race of people.

It was possible as Mr. Long supposed that the Hindu city of Bhubaneswar had been founded on the ruins of a more ancient Buddhist city, but it might be doubted if Buddhism had ever become the paramount religion in Orissa. The inscriptions over the caves showed, if he recollected right, that the king who recorded his deeds there, had adopted the Brahminical faith on ascending the throne. The site of the ancient city of Kosala did not seem to be quite certain, but Mr. Turnour's Ceylon discoveries showed that it had been a city of note in the Kingdom of Kalinger and that the sacred Book of Buddha had for a time been deposited there. Mr. Samuells confirmed Mr. Long's account of the great beauty of the lintel of the door-way now lying in the sand near the old temple at Kunaruk commonly called the Black pagoda. He considered it far superior to any of the sculptures in the Museum and advised that when a pilot vessel is despatched to Pooree in the cold weather, the Government be requested to allow her to call at Kunaruk and take the stone on board. He regretted that Captain Dixon's Photographs had not been laid on the table to illustrate Mr. Long's remarks on the caves at Khundgiri, but bore testimony to the fidelity of his descriptions and the general value of his remarks.

Mr. Cowell read Professor Max Muller's paper on the origin of writing in India.

The thanks of the Meeting were voted to the learned Professor for his extremely able and valuable paper.

Major R. Tytler exhibited another most interesting selection from his fine series of photographs illustrative of Indian architecture, for which he received the thanks of the meeting.

The officiating Librarian submitted the usual monthly report.

List of Books received in May.

*Presentations.*

Prison returns of the North Western Provinces, for the year 1856.—FROM THE GOVERNMENT N. W. PROVINCES.

Report of the Results of the Administration of the Salt Department during the year 1857-58.—Do.

Selections from the Records of the Madras Government, No. LIII. A, viz. Report of the Railway Department for 1857.

No. 55. Report on Civil Dispensaries for 1857.—BY THE HOME GOVERNMENT.

*Zeitschrift der Deutschen Morgenlandischen Gesselschaft*, Dreizehnter Band 1 and 2 Helf. *Leipzig*, 1859.—BY THE ACADEMY.

Contribution towards an Index to the Bibliography of the Indian Philosophical Systems. By Fitz-Edward Hall, M. A., Calcutta, 1859.—BY THE AUTHOR.

*Atlantis*, a Register of Literature and Science, conducted by the Members of the Catholic University of Ireland, No. III., January, 1859.

Report of the Government Central Museum, Madras.

Hindu Law and Judicature from the Dharma Sastra of Yajnavalkya, by E. Roer and W. A. Montriou.—BY THE EDITORS.

Report of the Oriental Seminary for the year 1858-59.

*Purchased.*

Literary Gazette, Nos. 38, 39, 40 and 41.

*Annales des Sciences Naturelles*. Tome IX., No. 6.

*Revue des Deux Mondes* for 15th March, 1859.

*Conchologia Iconica*, Part 183. *Crucibulum*, *Pinna*, *Columbella*.

*Athenæum* for March, 1859.

*Comptes Rendus*, Nos. 9, 10 and 11, 1859.

*American Journal of Science and Arts*, No. 80, March, 1859.

*Revue de Zoologie*, No. 2, 1859.

*Annals and Magazine of Natural History*, No. 16, April, 1859.

*Proceedings of the Royal Geographical Society of London*, Vol. III. No. 2.

*Westminster Review*, No. 30, April, 1859.

*Histoire de la Litterature Indienne*. Par Alfred Sadous. *Paris*, 1859.

*La Puissance Militaire des Anglais dans l'Inde et l'insurrection des  
Cipayes*, par le Commandant, Ch. Martin. *Paris*, 8vo., 1859.

*Revue Americaine et Orientale*, No. 1. *Paris*, 1858, pamphlet.

*Die Lieder des Hafis*, Von Hermann Brockhaus, Vol. 2, Parts 1 and 2.

*Pantschatantrum*, Pars secunda, particula prima.

*Roussac's Calcutta Directory*, for 1859.

The following additions have been made to the Library since the Meeting in June last.

*Presentations.*

*The Indian Annals of Medical Science*, No. XI., January, 1859.

*Proceedings of the Royal Society*, Vol. IX., No. 34.

*London, Edinburgh, and Dublin Philosophical Magazine and Journal of Science*, Nos. 114 and 115, for April and May, 1859.

*The Oriental Baptist* for June, 1859.—BY THE EDITOR.

*The Calcutta Christian Observer* for June, 1859.—BY THE SAME.

*The Oriental Christian Spectator* for May, 1859.—BY THE SAME.

*Rollin's Ancient History*, in 6 Vols. By T. Oldham, Esq.

*Narrative of the Mutinies in Oude*. By Capt. G. Hutchinson, B. Engineers.—FROM THE GOVERNMENT OF INDIA.

*Observations sur les Mœurs De divers Oiseaux du Mexique*, par H. de Saussure. *Genève*, 1858.

*Description de Divers Espèces Nouvelles ou peu Connues du Genre Scolia*, par H. de Saussure. *Paris*, 1858.

*Catalogus Codicum Hebraeorum Bibliothecae Academy Lugduno, Batavae*, Auctore M. Steinschneider, 1858.—BY THE BATAVIAN SOCIETY.

*Journal of the North-China Branch of the Royal Asiatic Society*, No. II. May, 1859, Shanghai.

*Report on the Land Revenue Administration of the Lower Provinces, for 1857-58*.—BY THE BENGAL GOVERNMENT.

*Memoires de la Societe Imperiale des Sciences Naturelles de Cherbourg*. Tome IV. 1856 and Tome V. 1857.—BY THE SOCIETY THROUGH THE FRENCH AMBASSADOR.

*Memoirs of the Geological Survey of India*, Vol. 2, Part 1. On the Vindhyan rocks and their associates in Bundelkund, with Map.—By H. B. MEDLICOTT.—BY THE GEOLOGICAL SUPERINTENDENT.

*Annual Report of the Superintendent of the Geological Survey of India, &c.* 1858-59.—Do.

*Bibidharta Sangraha* for Pous and Bysakha, Saka, 1780-81.—BY THE EDITOR.

A Panoramic View of the Mountains of Kashmir, sketched by Capt. T. G. Montgomerie.—BY MAJOR H. L. THUILLIER.

Abhandlungen für die Kunde des Morgenlandes—1. Band, No. 5. Leipzig, 1859.

*Purchased.*

The Natural History Review and Quarterly Journal of Science, for April, 1859.

The Quarterly Review, for April, 1859.

Revue et Magazin de Zoologie, No. 3, 1859.

Annals and Magazine of Natural History, No. XVII. for May, 1859.

Revue des deux Mondes for 1st and 15th April, and 1st May, 1859.

Annales des Sciences Naturelles, Tome X. No. 1.

Journal des Savants, March and April, 1859.

Comptes Rendus, Nos. 12 to 16, March and April, 1859.

The Literary Gazette, Nos. 42 to 46.

The Athenæum for April, 1859.

A Grammar of the Arabic language, translated from the German of Caspari. By William Wright. Vol. 1st, 1859.

Edinburgh Review for April, 1859.

The Unadi Sutras of Ujjaladatta.

FOR JULY, 1859.

The monthly General Meeting of the Asiatic Society of Bengal was held on the 6th Instant.

A. GROTE, Esq., President, in the Chair.

The proceedings of the last Meeting were read and confirmed.

*Presentations were received.*

1. From Herr Robert Schlagintweit of Berlin a case containing 20 Ethnological copper casts of Heads from India and High Asia, together with a prospectus of Messrs. Schlagintweit's collection of the same.

These casts are a selection from a large collection, comprising 270 casts of the face, and 31 of the hands and feet, made by the Messrs. Schlagintweit during their recent travels in Asia.

The original moulds have been reproduced by making strong metallic casts of zinc the basis, and coating them with a galvanoplastic deposit of copper varied in tint according to the different degrees of colour of the native Tribes.

The entire series supplies perhaps the most important contribution, that has yet been made to the study of Indian Ethnology.

Major Thuillier, proposed a special vote of thanks to the Messrs. Schlagintweit for this very valuable and interesting contribution to the Society's Museum.

Carried unanimously.

2. From J. W. Garstin, Esq., Deputy Magistrate, Buxar, through E. A. Samuells, Esq., 2 stone and 2 iron shot for the wooden guns previously presented to the Society by Mr. Samuells, and some broken fragments of the same.

3. From T. Oldham, Esq., a copy of Rollin's Ancient History in 6 vols.; Memoirs of the Geological Survey of India, Vol. II. Pt. I. and Annual Report of the Superintendent Geological Survey of India, &c. for 1858-59.

4. From Mons. Garcin de Tassy, a copy of an address delivered by him, May 5th, 1859, at the opening of his Hindustani course at the Ecole Imperiale des langues Orientales Vivantes.

5. From Major H. L. Thuillier, part of a Panoramic view of the Kashmir mountains, sketched by Captain T. G. Montgomerie.

R. H. M. Warrand, Esq., B. C. S, duly proposed at the last Meeting was ballotted for and elected an ordinary member.

The following gentlemen were named for ballot as ordinary members at the next Meeting.

C. W. Wilmot, Esq. proposed by Mr. Atkinson and seconded by Mr. Grote.

Captain J. E. Gastrell, 13th Regiment N. I. proposed by Major H. L. Thuillier and seconded by Mr. Grote.

J. B. N. Henessey, Esq. 1st. Asst. Great Trig. Survey of India, proposed by Lieut.-Col. A. S. Waugh, and seconded by Mr. R. Spankie.

Lieut. W. G. Murray, 68th N. I. proposed by Lieut.-Col. A. S. Waugh and seconded by Major Thuillier.

W. Scott, Esq. chief Draftsman, S. G. O. proposed by Lieut.-Col. A. S. Waugh and seconded by Major H. L. Thuillier.

W. T. Blanford, Esq. proposed by T. Oldham, Esq. and seconded by Mr. Grote.

J. Obbard, Esq. proposed by Major Thuillier and seconded by Mr. Atkinson.

Baboo Boloi Chand Singh proposed by Baboo Rajendralall Mitter, and seconded by Baboo Jadava Krishna Singh.

Maharajah Narendra Narain Bhupa of Cooch Behar, proposed by Baboo Rajendralall Mitter, and seconded by Mr. Grote.

The President on the part of the Council moved that the Society do sanction the expenditure of a sum not exceeding Rupees 500 for the purchase of Books from the Library of the late Dr. Walker now on sale. Sanctioned.

*Communications were received*

1. From C. Beadon, Esq., Secy. Government of India, Foreign Department, enclosing copy of a letter to the Government of Bombay from Her Majesty's Consul at Zanzibar reporting the arrival at that place of Captains Burton and Speke on their return from the Equatorial African expedition and enclosing a sketch map of their route by Captain Speke.

The following is the letter :—

FROM CAPTAIN C. P. RIGBY,

*Her Majesty's Consul and British Agent, Zanzibar.*

TO H. L. ANDERSON, ESQ.

*Secretary to Govt., Bombay,*

*Zanzibar, March 17th, 1859.*

SIR,—I have the honor to report, for the information of the Right Honorable the Governor in Council, the safe arrival at this port on the 5th instant of Captains Burton and Speke of the East African Expedition. Both these officers were suffering from the effects of exposure and privations, but are already considerably improved in health, and they proceed to Aden, in an American vessel, which sails in a few days.

The objects contemplated in sending this expedition into East Africa appear to have been most successfully carried out as far as the limited time and means at disposal would admit of the exploration of so vast an extent of country.

The Lake of Tanganyaka situated about 600 miles from the East Coast, and never before visited by any white man, has been discovered and partially surveyed. Captain Speke travelled alone through an unknown country for about 5 degrees to the North East of Lake Tanganyaka and discovered the Lake Nyanza, a vast sheet of water extending North and South. The south extremity of this Lake is

situated in  $2^{\circ} 25'$  south Latitude and its length is so great, that no native on its shores has any idea where its northern limit terminates : and from its great elevation 3700 feet above the sea and the general slope of the country Captain Speke is confidently of opinion that the northern end of this great lake will prove to be the source of the white Nile.

Both Captains Burton and Speke talk in the highest terms of the assistance afforded to the expedition by His Highness Said Majid, and his officers, and of the friendly reception they everywhere met with from the Arab residents in the interior, through being provided with recommendations from His Highness.

Captain Speke describes the country visited by him as very populous, the Natives very friendly and courteous, the land well cultivated producing a great variety of grains and vegetables, Coffee, Cotton, Sugar cane, &c. also abundance of rich iron stone.

The Belooch Sepoys and Arabs who accompanied the expedition all talk of Captain Speke with the greatest affection ; by his kind and considerate treatment of them, he has acquired their entire confidence, and they are ready to accompany him again to any part of Africa ; from his tact in conciliating the Natives, his resolution, and scientific acquirements, I am confident he has proved himself eminently qualified for any future African explorations.

I herewith annex a small sketch Map by Captain Speke showing the routes travelled by the expedition, and the position of the newly discovered Lakes.

I have the honor to be, &c.

(Sd.) C. P. RIGBY, CAPT.

2. From Baboo Radhanauth Sikdar, an abstract of the Hourly Meteorological Observations taken at the Surveyor General's Office in the month of January last.

3. From Major H. L. Thuillier a memorandum on the Survey of Cashmir from the reports of Captain T. G. Montgomerie, Bengal Engineers, and the Surveyor General of India.

The paper was read by Major Thuillier, who also exhibited some fine specimens of topographical plan-drawing executed by the Officers of the Trigl. Survey.

The thanks of the meeting were given to Major Thuillier, for his very interesting paper.

The Officiating Librarian submitted the usual monthly report.

*Special Meeting.*

The meeting was then made special, pursuant to notice, in order to decide upon the reduction in the rates of subscription, and the rescinding of rule 49 as proposed by the Council.

The Secretary read the report of the Council recommending, that the existing rules, which regulate the rate of subscription be rescinded, and that in lieu thereof the following be adopted.

“Ordinary members shall be divided into two classes, one *Resident*, one *Non-resident*. All members who reside within 30 miles of Calcutta shall be deemed *Resident*. Residents shall pay an admission fee of Rupees 32, and a quarterly payment of Rupees 12. Non-residents shall pay an admission fee of Rupees 32, and a quarterly payment of Rupees 6. All payments to be made in advance, commencing from the quarter in which members are elected and continuing so long as they are residents in India.”

The question having been put by the President, the votes were found to be as follows:—

*For the new rule.*

|                                  |    |
|----------------------------------|----|
| Resident voters present, .. .. . | 13 |
| Non-Resident, .. .. .            | 19 |
| <hr/>                            |    |
| Total, .. .. .                   | 32 |

*Against*

|                                  |   |
|----------------------------------|---|
| Resident voters present, .. .. . | 5 |
| Non-Residents, .. .. .           | 0 |
| <hr/>                            |   |
| Total, .. .. .                   | 5 |

The new rule was therefore carried.

The Lord Bishop suggested that it might be desirable to provide for the payment of a single sum by way of composition for the annual subscriptions.

After some conversation the President undertook to bring the matter before the Council for consideration.

The question that rule 49, which prohibits the nomination or election of members on the day of the annual meeting, be rescinded, was then put and carried unanimously.



*Report of Curator, Zoological Department, for February to May Meetings, 1859.*

I have first to report on a few more gatherings from the Andamán Islands, additional to those noticed in Vol. XXVII, p. 267 *et seq.*

In the class of mammalia, inhabiting the dry land, we still know only of the human animal and the peculiar *SUS ANDAMANENSIS*; though Bats of different kinds have been observed, which as yet are undetermined; also a species of Rat, which is not of recent introduction.\* A slight notice and very rude figure of the skull of the tiny Hog from the *Little Andamán* are given in Jameson's *Edinburgh New Philosophical Journal*, Vol. XVI. (1826-7);† and to the imperfect description of this animal in my last report, it may be added that the tail is reduced to a mere tubercle (as in Mr. Hodgson's *PORCULA SALVANIA*). The animal is well clad with somewhat shaggy black hair.

1. Capt. Neblett, of the Steamer 'Sydney,' has presented us with some bones of a nearly half-grown Duyong (*HALICORE*), found in an Andamánese hut. They consist of a lower jaw, the two scapulæ, and four ribs; all daubed over in the usual way with stripes of the red pigment with which the islanders besmear their own persons. This is the first instance we know of the Duyong inhabiting the Bay of Bengal; though common in the Straits of Malacca and in the Gulf of Calpentyn in Ceylon, and also found off the Malabar coast, where known to Europeans as a Seal! The lower jaw from the Andamáns exhibits the deciduary præmolars worn by attrition to a flat surface, while the first pair of true molars had not yet pierced the gums, but were about to do so.

In the bird class, the Parrots have not yet been determined. Living specimens of *HÆMATORNIS CHEELA* and of *BLAGRUS LEUCOGASTER* have

\* A Mouse has since been taken from the stomach of a *TRIGONOCEPHALUS* from Port Blair. It appears to be the ordinary house Mouse of India (*MUS MANER*), and is therefore doubtless an importation. I have also information of a small quadruped from the same locality, which is probably a *TUPAIA*.

† All that is stated, however, occurs in the description of an Andamánese hut:—  
"Ranged in a row round the walls, were the smoked skulls of a diminutive Hog; the canine teeth shorter than in the other species of *Sus* in eastern countries, the jaws fastened together by strips of rattan." I have only seen the tusks of the lower jaw, and they are of full proportionate size. In the larger and older of two lower jaws, the tusks protrude more than  $1\frac{1}{2}$  in. from the bone, measuring anteriorly; in the other they are loose, had protruded more than  $1\frac{1}{4}$  in., as shewn by the colouring, and drawn from the socket they measure  $4\frac{1}{2}$  in. round the curve outside, and 3 in. in a line from base to *ground* tip externally.

been brought from Port Blair; and it appears that the latter species is common, as might be expected. This fine Sea-eagle preys chiefly on Sea-snakes; as the *CIRCAËTUS GALLICUS* does upon Land-snakes, whereas its near ally, the *HÆMATORNIS CHEELA*, subsists almost wholly on Frogs.

2. We are further indebted to our Secretary, Mr. Atkinson, for a few sundries from Port Blair, including perhaps a new species of black-naped Oriole, additional to the five noticed in Vol. XXIV. p. 477; but it requires to be compared with *O. CORONATUS*, Swainson (*O. hippocrepis*, Wagler), of the eastern archipelago, of which we do not possess a specimen. From *O. MACROURUS* of the neighbouring Nicobar Islands, to the southward, it is very conspicuously distinct. Some years ago a Javanese specimen of *O. CORONATUS* was lent to me, from which I took the following note. "Differs from *O. INDICUS* in having a narrower nape-mark, a shorter wing, and by the considerably reduced development of the yellow on the secondaries and tertiaries." The Andamán Oriole has no yellow at all on the secondaries and tertiaries, beyond a small yellow spot tipping the latter, and a slight *terminal* yellowish-white margin to the former. Colour of male brilliant yellow, with the nape-mark, wings beyond the coverts of the secondaries, and a portion of the tail, deep black. The female has a duskyish tinge on the mantle, and the exposed portion of the black part of the wings is tinged with green, as also the middle tail-feathers for the greater portion of their length. Middle tail-feathers in both sexes slightly tipped, and the rest successively more so to the outermost, with bright yellow. Bill carneous and legs plumbeous, as usual in the genus. Wing  $5\frac{1}{4}$  in; tail  $9\frac{3}{4}$  in.; bill to gape  $1\frac{3}{8}$  in. *N. B.* In colouring, this species resembles *O. MACROURUS* of the neighbouring group of the Nicobars, but it is smaller with narrower nape-mark and proportionally shorter tail, which last is commonly 5 in. in *O. MACROURUS*.

*EDOLIUS MALAYENSIS*, nobis. The *Bhimráj* of the Andamáns, as was remarked on a former occasion, is identical with the Malayan species, with rudimentary frontal crest. I had then only a young bird to judge from, but have now an adult, with well developed racket-tail, though perhaps a female. It agrees with some specimens from Pinang, having the frontal crest so rudimentary as to be scarcely noticeable unless specially looked for, and therefore accords better than any other with Sonnerat's figure of his *Grand Gobemouche de la côte de Malabar* (so nearly crestless a race being, however, unknown on the western side of the Bay of Bengal). Some Pinang specimens, however (perhaps males), have a slight frontal crest, measuring from  $\frac{3}{8}$  to  $\frac{1}{2}$  in. long, when the feathers are pulled straight, and which is therefore conspicuously noticeable, though small. It is probably longest

in particularly fine old males : yet in one specimen from Pinang with unusually developed racket-tail, the crest is small and inconspicuous. The length of wing, in Pinang specimens, seems rarely to exceed 6 in. : in the example referred to, with particularly fine tail, it is just 6 in. In our adult Andamán specimen, with scarcely a trace of frontal crest, the closed wing measures  $6\frac{1}{2}$  in., and 6 in. in our young Andamán specimen. In three adult examples now brought from the interior of the Tenasserim provinces by Mr. Atkinson, the length of wing varies from 6 to  $6\frac{3}{8}$  in., and the crest is moderately developed, though still rather small, some of the feathers composing it measuring  $1\frac{1}{4}$  in. We have a Tenasserim specimen, however, with the longest crest-feathers  $2\frac{1}{2}$  in. in length ; wing  $6\frac{3}{8}$  in. : another from Tippera, with crest-feathers  $2\frac{3}{8}$  in., and wing  $6\frac{7}{8}$  in. But in the ordinary *Bhimráj* of Bengal, Nepal, Asám, Sylhet, and Arakan, the crest-feathers rarely exceed  $1\frac{3}{4}$  in., and are generally less ; while the wing in adults is commonly from  $6\frac{1}{2}$  to nearly 7 in. It is probable that the crest is mostly larger in the male than in the female, and longest in particularly fine old males—even to the extent represented by Stephens in his continuation to Shaw's Zoology, which figure may be contrasted with that of Sonnerat.

In an example from Ceylon, the closed wing is but  $5\frac{3}{4}$  in. ; and the frontal crest is little larger than in some Pinang specimens, the feathers straightening to  $\frac{5}{8}$  in. : but the bill measures only  $\frac{3}{4}$  in. from nostril to tip ; whereas in the adult Andamán bird it is here a full inch, about  $\frac{7}{8}$  in. in the Pinang specimens, and commonly 1 in. in the long-crested specimens from Bengal, &c. Two examples from the peninsula of India agree exactly, so far as I can perceive, with ordinary Tenasserim specimens, which seem to have the crest rather smaller, on the average, than the birds obtained further north. The *Edolius dentirostris* and *D. orissæ* of Dr. Jerdon (*Madr. Journ.* XIII, 121,) are much in need of confirmation. After considerable study of numerous specimens from various localities, I can at present recognise two races only, as sufficiently distinguishable, being the crestless or almost crestless one from the Andamáns and Malayan peninsula, and the conspicuously crested race elsewhere. When better known, each from an adequate series of both sexes and of all ages from whatever locality, it is probable that these will be acknowledged as two species ; and then follows the question of nomenclature.

The crested is the *Cuculus* (!) *paradiseus* of Linnæus, founded on the *Cuculus siamensis cristatus viridis* of Brisson, wherein both the existence of the crest and the *habitat* are indicated ; *ergo* EDOLIUS PARADISEUS.

The crestless (more or less so) is the *malabaricus* as described by Latham after Sonnerat, but not as figured by Latham and by Stephens ;

but the name *malabaricus* is inapplicable, as equally *rangonensis* of Gould ! Wherefore, there seems no help for it but to propose *E. MALAYENSIS* ; unless the name *retifer* of Temminck be adopted, which however refers to either.

*TEMENUCHUS ERYTHROPYGUS* ; *Sturnia erythropygia*, nobis, *passim*. Two more specimens from Port Blair, but still wanting the deep ferruginous colouring on the rump and upper tail-coverts : however, it is faintly indicated, and that intense colouring is probably peculiar to old males. There can be no doubt about the correctness of the identification.\*

*KITTACINCLA ALBIVENTRIS*, nobis. The peculiar *Shama* of the Andamans. Three more specimens, all males, and true to the characters described. It is as fine a songster as the Indian bird, by all accounts.

*IRENA PUELLA*, Horsfield ; *I. indica*, A. Hay. Two males and a female. The Indian race, as distinguished from the Malayan, having shorter lower tail-coverts.

*PERICROCOTUS PEREGRINUS*, (L.)

*CARPOPHAGA SYLVATICA*, Tickell, as before.

It appears that *CALENAS NICOBARICUS* is common ; † also ‘ Water Wag-tails’ in the cold season, no doubt *MOTACILLA LUZONIENSIS* of the neighbouring countries ; ‡ and that *edible nests* are collected in the islands, where there can be no doubt that the constructors of them, both *COLLOCALIA NIDIFICA* and *C. LINCHI*, occur. Mr. Alexander, in his notice of the Little Andamán, mentions having seen “flocks of Sand-larks, Curlews, &c.,” which may be looked for as a matter of course. We are assured that three or four kinds of Parrot occur, which is probable enough, one being the tiny *LORICULUS VERNALIS* for certain.

Of reptiles, we know that at least that one *VARANUS* exists upon them ; and Mr. Alexander remarks, of the Little Andamán, that “numerous Snakes were observed sneaking amongst the bushes. From several we had narrow escapes. Those that we succeeded in killing, were all furnished with the poisonous fangs ; and many of them bore a striking resemblance to the *Coluber prester* or Viper, but they were all spotted.” Most probably my *TRIGONOCEPHALUS CANTORI*, described from the Nicobars.§

\* Length of a fresh specimen  $7\frac{1}{4}$  in. by 12 in. ; closed wing  $4\frac{1}{8}$  in. ; tail 3 in. Bill to gape  $1\frac{1}{8}$  in. ; its colour yellow, leaden-blue at base of lower mandible. Legs ochreous-yellow ; the tarse 1 in.

† Colonel Phayre obtained this bird alive, from the Cocos islands N. of the Andamans, several years ago.

‡ Lately received, both in summer and winter dress, from China (Amoy).

§ Since received, with a Mouse in its stomach ; also the rare *HAMADRYAS VIT-*

Mr. Atkinson has brought one Lizard in spirit, which I take to be the female of a new species of *DILOPHYRUS*, wherein the nuchal crest is very small, and the dorsal crest is reduced to a mere keel,—perhaps a sexual distinction: on each side of the occiput a small white tubercle. As we shall probably soon receive other and male examples, with developed crests, it is not desirable to describe from this first individual.

Of fishes, only a fine species of *BALISTES*, allied in form to *B. BICOLOR*, Shaw; wholly black, except a white line at base of second dorsal and another at base of anal fins, and a narrow white edge to the tail. From the Nicobars we possess *B. BICOLOR*, and another undetermined.

Among the species collected by Dr. Liebig at Port Blair should have been enumerated *SPRATELLA FIMBRIATA*, Val.\*

Mr. Atkinson has brought a few *Crustacea* and *Radiata*; but as I have reason to expect more extensive collections shortly, I defer noticing them further, and this also from want of space on the present occasion.

In the course of a trip to the mountains of the interior, from Moulmein, Mr. Atkinson collected various specimens, the more remarkable of which I now proceed to notice. The mammalia are—

*MACACUS CARBONARIUS*, F. Cuv.; of which *M. auratus*, Is. Geoffroy, figured in the *Zoologie* of Belanger's *Voyage*, is a *pyrrhous* variety. *M. CARBONARIUS* is the common long-tailed *MACACUS* of the Burmese countries, and is nearly akin to *M. CYNOMOLOGOS*, so abundant in the Malayan peninsula and archipelago; but has no crest on vertex, and a blackish face with white eye-lids, as in the Mangabey Monkeys of Africa. It is a great devourer of *Crustacea*, which it finds during the ebb of the tide.

*TUPAIA FERRUGINEA*, var. *peguensis*. Common from the Kás'hya hills down to Mergui.

*SCIURUS BICOLOR*, Sparrman.

*SC. CHRYSONOTUS*, nobis. Remarkably fine. From the interior.

*SC. PHAYREI*, nobis, *J. A. S.* XXIV, 476. A second example of this well marked species, true to the characters described, and obtained halfway between Amherst and Moulmein.

*TATUS*, obtained at Port Blair by Capt. Eales, commanding the 'Fire Queen,' S. V.; and from Capt. Hodge, commanding the guard-ship 'Sesostris,' at Port Blair, two specimens of *DENDROPHIS PICTUS*, greener or less bronzed than usual; together with a fine example of a fish—*PTEROIS ANTENNARIUS*, some Crabs—*GRAPSUS STRIGOSUS*, and larvæ of an *ACHERONTIA*.

\* Numerous species of fishes have since been received from Capt. Hodge, which will be noticed in a future Report.

SC. ATRODORSALIS, Gray. A fine and instructive series of this variable species, wherein the hue of the under-parts varies from pale buff to dark maronne, and the black patch on the back—greatly developed in some, is entirely wanting in others. The face appears always to be reddish, the ears deep rufous, and the whiskers are conspicuously white, whereas in the last two species they are black. Tail more or less bushy, its long hair tipped either with rufous or whitish, and sometimes a distinct white tip. It would seem that the young are pale rufous-buff underneath, with no black patch on the back; and one without black upon the back has the breast pale and the sides and belly maronne, whereas another has pale under-parts throughout and a large black dorsal patch. A common species at Moulmein.

SC. BARBEI, nobis, J. A. S. XVI, 875.

PTEROMYS CINERACEUS, nobis: sent also by Colonel Phayre from Pegu, as formerly from Arakan; together with a SCIUROPTERA from Pegu, received formerly from Mergui, and which I considered to be SC. SAGITTA, but shall now designate SC. PHAYREI.\*

\* The 'Flying Squirrels' are among the most difficult of groups in which to define the species or perhaps local races. Eighteen specimens of PTEROMYS were exhibited at the Meeting, which are referable to six distinguishable races; and sixteen specimens of SCIUROPTERA, which are referable to seven species or distinguishable races, that are better characterized than those of PTEROMYS. The whole are continental, and there are also various races in the archipelago; besides which, we have not yet examples of all of the continental races which have been described, nor of SC. LAYARDI from Ceylon. I will endeavour to elucidate the grand series, distinguishing those of which we possess specimens by prefixing an asterisk.

\*1. PTEROMYS PETAURISTA; *Sciurus petaurista (mas)*, Pallas: *Pt. philippensis*, Gray, apud Elliot; *Pt. oral*, Tickell. Found without variation over the forests of the whole Indian peninsula and also Ceylon. Of a dark maronne; having the fur tipped with white on the head and back: feet, and greater portion of the tail, black, the latter with occasionally a white extreme tip: lower-parts white more or less pure.

\*2. PT. CINERACEUS, nobis; *Pt. petaurista*, var. *cineraceus*, nobis, J. A. S. XVI, 865. From the Burmese countries—Arakan, Pegu, Tenasserim. Very like the last, but the fur more uniformly white-tipped, even on the parachute-membrane; paws black; and tail generally white almost to the end, but mostly black at the extreme tip: lower-parts white, more or less pure.

3. PT. PHILIPPENSIS (verus), Gray. Founded (it may be presumed) upon Buffon's description of the *Taguan* from the Philippines, in *Hist. Nat., Supp.* III, 150.

Of birds, an undescribed Kestrel,—

TINNUNCULUS SATURATUS, nobis, *n. s.* Many years ago, the Society received a specimen from Yé (Tenasserim), presented by the Rev. J. Barbe,

4. PT. ELEGANS, S. Müller; by whom figured. From Java. The white-tipped fur of the back contrasting strongly with the bright rufous-bay sides, limbs, and also paws; tail more blackish to the end; head palish rufous: lower-parts much suffused with rufous.

5. PT. PUNCTATUS, Gray (*A. M. N. H.* XVIII, 211). From Malacca. "Bright bay; back ornamented with white spots [or *splashes*]. The only species of the genus that has any white on its back. Skull much smaller than in the other Asiatic species of PTEROMYS." (Gray.) I saw the specimen described, which was taken to England by Major Charlton.

\*6. PT. INORNATUS, Is. Geoffroy (*Zoologie* of Jacquemont's 'Voyage'). From the N. W. Himalaya. Darker than in Prof. Is. Geoffroy's coloured figure, with slight hoary tips to the fur, and often not any; the paws infuscated; and the tail-tip blackish: under-parts white, with mostly a rufous tinge. So far as I have seen, this and PT. CINERACEUS grow to a larger size than the others.

N. B.—This would appear to be *Pt. albiventer* apud Gray, *P. Z. S.* 1836, p. 88, and *Br. Mus. Catal.*; but not that so named in Hardwicke's Illustrations.

PT. GRISEOVENTER, Gray, *Br. Mus. Catal.*, is thus described (?): "*a.* Beneath dark grey: *b.* Beneath paler grey, back edge of the fore-legs browner than *a.*" *Habitat* not mentioned.

PT. MELANOTIS, Gray, from Java, is not described at all: but *Pt. Diardii*, Temminck, is given as a synonyme, and *Pt. nitidus*, Gray, of Hardwicke's Illustrations, as a doubtful synonyme.

PT. DIARDII, Tem., is unnoticed in Dr. S. Müller and H. Schlegel's monograph of the genus.

\*7. PT. NITIDUS Geoff.: *Sciurus petaurista*, *fœm.*, Pallas. From the Malayan peninsula, Sumatra, Java, and Borneo. Bright rufous-bay, with black paws and tail-tip: under-parts rufescent. According to Dr. Cantor, "the part of the head anterior to the ears, the cheeks, the chest, and the abdomen, are white in some individuals of either sex, one of which is figured in Hardwicke's *Illustrations of Indian Zoology*, under the denomination of *Pt. albiventer*, Gray." The same observer notices, as a doubtful variety, the PT. PUNCTATUS, Gray, having the "back very dark Indian red, with a few dashes of pure white."

\*8. PT. MAGNIFICUS, Hodgson. From the S. E. Himalaya—Nipál, Butan, Asám, and Kás'hya hills. Bay, or maronne, more or less bright, above, and copiously white-tipped: beneath white, sometimes tinged with rufous; the paws rufous in some, infuscated in others; and tail black-tipped to a variable extent.

\**Sciuropterus nobilis*, Gray; *Pt. chrysotryx*, Hodgson. From Nepál and Sikhím. Vide *J. A. S.* XVI, 866; and I adhere to the opinion there expressed that

R. C. M., which is noticed in my Catalogue of Birds (No. 69, I,) as "per-  
this is a mere variety of the last. The series of specimens in our museum demonstrates this beyond further question.

9. *PT. LEUCOGENYS*, Temminck. Japan.

These various races of large 'Flying Squirrels' with long and cylindrical tail bear the same relationship together, as do the numerous races of gigantic Squirrels which inhabit the same geographical region, and which were brought together by the late Prof. Temminck by the name *SCIURUS GIGANTEUS*.

The smaller 'Flying Squirrels' with flat and distichous tail constitute the genus *SCIUROPTERA*, F. Cuv.

\*1. *SC. CANICEPS*, Gray : *Sc. senex*, Hodgson. From Sikhim.

2. *SC. LAYARDI*, Kelaart, nobis, *J. A. S.* XX, 165. Mountains of Ceylon.

3. *SC. BABERI* (?), nobis, *J. A. S.* XVI, 866. Trans-Himalayan ?

\*4. *SC. FUSCOCAPILLA*, Jerdon, nobis, *J. A. S.* XVI, 867. Malabar. Akin to the next. (A good species since added to the museum.)

\*5. *SC. FIMBRIATA*, Gray : *Pteromys Leachii* (?), Gray. N. W. Himalaya.

\*6. *SC. ALBONIGRA*, Hodgson : *Pteromys Turnbullii*, Gray. S. E. Himalaya.

\*7. *SC. VILLOSA*, nobis, *J. A. S.* XVI, 866. Sikhim, Butan, Asamese mountains.

8. *SC. HORSFIELDII* ; *Pteromys Horsfieldii*, Waterhouse : *Pt. aurantiacus*, Wagler. Malayan peninsula.

9. *SC. GENIBARBIS*, (Horsfield.) Java, Malayan peninsula.

10. *SC. LEPIDA*, Horsfield. Java. *N. B.* This and the preceding race or species would appear to hold the same mutual relationship as *SC. VILLOSA* and *SC. ALBONIGRA* of the S. E. Himalaya.

\*11. *SC. PHAYREI*, nobis. *n. s.* : *Sc. sagitta* of Burma, *apud nos, passim*. Rangoon, Mergui. Like *SC. ALBONIGRA*, but considerably smaller, and the tail much less bushy. Length 6 to 6½ inches ; the tail (vertebræ) 5¼ in. ; hind-foot with claws 1⅜ in.

\*12. *SC. SPADICEA*, nobis, *J. A. S.* XVI, 867. Size of *SC. VOLUCELLA* ; from Arakan.

13. *SC. MOMOGA*, Temminck and Schlegel. Japan.

14. *SC. VOLANS* ; *Sciurus volans*, L. : *Pteromys sibiricus*, Desmarest ; *Pt. russicus*, Tiedemann. Siberia, Lapland.

15. *SC. VOLUCELLA* ; *Sciurus volucella*, Pallas : *Mus volans*, L. ; *Sciurus acrobates*, Schreber ; *Sciuropterus americanus*, Desm. N. America.(')

16. *SC. SABRINA* ; *Sciurus sabrinus*, Shaw : *Sc. hudsonius*, Forster. N. America.

*N. B.*—The true *SC. SAGITTA* will be a small Javanese species. M. M. Temminck and Schlegel unite under this name Nos. 5, 6, 8, 9 and 10, which can be little more than guess-work. The first three of this series attain to about 2 ft. in total length : No. 12 scarcely exceeding 9 in.

(') Of this we possess a skeleton.



haps the female of a distinct race, remarkable for the great development of the black markings of its plumage." Mr. Atkinson has now brought a young female of the same race, in which the cap is fuscous, with scarcely an indication of rufous margining the feathers, the fuscous colour also predominating over the rufous upon the whole upper plumage, and on the tail the rufous bands are narrower than the black bands. The adult male is still a desideratum.

*PERICROCOTUS ELEGANS* (?), McClelland, as distinguished from *P. FLAMMEUS* of S. India and Ceylon. A female (?), of the size of *P. FLAMMEUS*, but the yellow portion of the plumage much deeper than in that species, and also much more of this colour upon the forehead, where brighter and better defined than in the female of *P. SPECIOSUS*. *P. ELEGANS* is described from Asâm.

*PHYLLOSCOPUS TROCHILOIDES*, (Sundevall). Mentioned on account of the locality.

Of reptiles, *ACANTHOSAURA ARMATA*, Gray; and a beautiful Gecko from the interior:—

*NAULTINUS VARIEGATUS*, nobis, *n. s.* Unguinal and penultimate phalanges of toes long and compressed. Body and sides uniformly studded with large tubercles, which gradually disappear on the tail; the lower-parts covered with large flat scales, bounded by a prominent ridge on each flank: series of femoral pores extending quite across, and behind these, anterior to the vent, four scales larger than the rest: a few small scales posterior to the vent, followed by a series of broad subcaudal plates. Scales upon head and throat minute, those on the face anterior to the eyes larger. Eyes large with vertical pupils. Colour grey, beautifully spotted and marbled with black, set off with subdued white. Lower-parts whitish, freckled on the tail with black, and gradually more of this to the extremity, the terminal third being almost wholly blackish; above, the tail is irregularly banded. A broad dark streak bordered with whitish behind each eye, and continued irregularly round the occiput. On the back the markings appear as irregular bands, paler internally and blackish on their zigzag borders, most difficult to describe intelligibly; the head above is spotted and not banded. Entire length  $6\frac{5}{8}$  in., of which the tail measures  $3\frac{5}{8}$  in.\*

A few fishes will be noticed subsequently; together with Major Berdmore's specimens and others.

\* Since referring the above species to *NAULTINUS*, Gray, I have seen his figure of *N. PACIFICUS* (*Platydictylus Duvaucelii*, D. et B.), of new Zealand, in the Zoology of the Voyage of H. M. S. 'Erebus,' and perceive no reason to alter the arrangement.

3. R. Swinhoe, Esq., of Amoy, has favored us with a collection of bird-skins from Amoy and Formosa, supplying fine examples of several species which have hitherto been poorly represented in the museum.

Among these may be noticed *GRACUPICA NIGRICOLLIS* (*Pastor temporalis*, Tem.), and *TEMENUCHUS SINENSIS* (*Oriolus sinensis*, as distinguished from *chinensis*, Gmelin); and there are also fine specimens of *S. SERICEUS* and of *ACRIDOTHERES CRISTATELLUS*.

Also several species more or less common in Lower Bengal, or hitherto known only or chiefly from the Himalaya; as *HALCYON SMYRNEENSIS*, *CERYLE RUDIS*, *ALCEDO BENGALENSIS*, *YUNX TORQUILLA*, *CUCULUS TENUIROSTRIS*, *HIRUNDO RUSTICA* (*gutturalis*), *H. DAURICA*, *DICRURUS MACROCERCUS*, *LANIUS LUCIONENSIS* (*verus*), *COPSYCHUS SAULARIS* (fœm.), *IANTHIA RUFILATUS* (fœm.), *PHYLLOSCOPUS FUSCATUS*, *REGULOIDES PROREGULUS*, *R. CHLORONOTUS*, *HEMICHELIDON LATIROSTRIS*, *MOTACILLA LUZONIENSIS* (summer and winter plumage), *CORYDALLA RICHARDI*, *PIPASTES AGILIS*, and some common small waders, as *ACTITIS GLAREOLA* and *A. HYPOLEUCOS*, and *TRINGA SUBARQUATA*.

Of species new to the museum, a fine Bat (undetermined), the handsome Grosbeak—*EOPHONA MELANURA*, (Gm.), and several apparently new species which Mr. Swinhoe will name and describe.

4. J. H. Gurney, Esq., M. P., of Catton Hall, Norwich. Skeletons of *SULA BASSANA* and *GRACULUS CARBO*; and some skins of British birds of species either previously wanting in our museum, or insufficiently represented, and one of *MACRORHAMPHUS GRISEUS* from N. America for comparison with *M. SEMIPALMATUS*, nobis (*J. A. S. XVII*, 252), of India.

The last named species, of rare occurrence unless on the sea-coasts of this country, was not admitted as distinct by the late Prince of Canino, who, had he seen a specimen, would unquestionably have elevated it to the rank of a separate named division. It is a much larger bird than *M. GRISEUS*, with a proportionally longer and still more thoroughly Snipe-like bill, while the semi-palmation of the toes at once distinguishes it. The plumage, too, is very different, and in our Indian bird considerably resembles that of most Ruffs in winter dress: the rump is uniformly coloured with the back; whereas the other has a pure white rump, becoming gradually more mottled to the upper tail-coverts; and the Indian bird is almost wholly white under the wings, where the other has every feather mottled with dusky. The diversity of the two species is accordingly about as obvious as it well can be, while the difference of form is much greater than in very many divisions separated and named by the Prince of Canino. Concurring in the opinion that it should be thus separated, I propose for it the name *PSEUDOSCOLOPAX SEMIPALMATUS*.

A fine adult example of a British Peregrine Falcon (*FALCO PEREGRINUS verus*) quite bears out the opinion of the Prince of Canino, Mr. Gould, and others, that the *Bauri* Falcon of India should be recognised as distinct, by the name *F. CALIDUS*, Latham. A glance suffices to distinguish them. The European Peregrine has more colour on the lower-parts, which, however, do not approach in depth of hue those of the *Sháhin* Falcon (*F. PEREGRINATOR*) of India; and it differs both from the *Bauri* and *Sháhin* by having the lower-parts, thighs, and beneath the wings, much more strongly barred, the breast being also much more conspicuously spotted with large well developed 'drops.' In the *Bauri* the breast is uniformly much whiter, and the spots are almost confined to a narrow black mark on the stem of each feather, even this disappearing on a large proportion of the feathers in some specimens. The *Bauri* has likewise much more and brighter yellow upon the cere and base of bill, than has the European Peregrine. In size and structure they agree; but admitting the *Bauri* and *Sháhin* to be distinct species, as all must admit that *know* them (and these inhabiting the same country—albeit the former keeps more to the plains and the latter to the hills), there is no alternative but to consider the European Peregrine as also equally distinct, and likewise the Australian *FR. MACROPUS*, Swainson (v. *melanogenys*, Gould).

Three specimens of the European *RALLUS AQUATICUS* present the usual distinctions from *R. INDICUS*, nobis, *J. A. S. XVIII*, 820: the Indian Water Rail being larger, with conspicuously thicker bill and legs, the latter obviously of a different colour from those of *R. AQUATICUS*. The ash-colour of the lower-parts is invariably much less pure, being always greatly mingled with brown in *R. INDICUS*. Again, there is a well marked dark streak below the eye of *R. INDICUS*, continued back over the ear-coverts, which does not occur in *R. AQUATICUS*. Length of closed wing, in three specimens of *INDICUS*, exceeding 5 in.; in the three of *AQUATICUS*, under  $4\frac{1}{2}$  in.; vertical depth of bill at base scarcely exceeding  $\frac{1}{4}$  in. in *R. AQUATICUS*, about  $\frac{1}{2}$  in. (and sometimes even more) in *R. INDICUS*.\*

5. Major W. S. Sherwill. Some minute fishes from the Mutla, taken in mid-stream during the height of the tide. Among them I recognise a single individual of a second species of the genus *BOGODA*, Bleeker,

\* The Corn-crake or 'Land-rail' (*ORTYGOMETRA CREX*) is very rare in India, though common in Afghanistan, and Afghan specimens are undistinguishable from British. It should occur therefore about Pesháwur. The well known sportsman PURDY mentions having killed a Land-rail in Oudh, remarking that it was the only one he ever saw in India (*Beng. Sp. Mag. XIX*, 270); and this is the sole instance I know of a Land-rail having been observed in this country.

and several of a remarkable new generic form akin to the ZEUS or 'John Dory.' These are described, for want of space here, in a paper on new species of fishes.

6. Babu Rajendra Mállika. The carcass of a male Ostrich, and of some other animals that had died in his menagerie.\*

7. W. T. Blanford, Esq., of the Geological Survey. Skeletons of GERONTICUS PAPILLOSUS and ANASTOMUS OSCITANS.

8. Mrs. J. H. Ballin. A bottle of Snakes.

9. Mr. E. C. T. Tate, of the Ganges Company's Steamer 'Mirzapore.' A fine example of SQUILLA RAPIDIA.

10. Mr. J. Floyd, Alipore. A four-legged chick, of very singular formation, which died of paralysis when a month old.

11. Dr. Mouat. Some skulls of SUS ANDAMANENSIS, nobis; and the skull of a cow Buffalo of the wide-horned type, the horns of which attain occasionally so enormous a length. (*Vide Proc. Zool. Soc.* 1855, p. 17.) A detached pair in the British Museum are each  $6\frac{1}{2}$  ft. round the curvature.

12. H. H. The Máharája of Burdwán. A remarkable bezoar taken from the stomach of a Giraffe. It is shaped like a short lemon, 3 in. in greatest length, encrusted with a soft calcareous substance having a smooth vermiculated surface, beneath which is a layer of the agglutinated hairs of the animal; and the same alternation occurs apparently in successive concentric layers. Among the stuffed mammalia presented by the Máharája, as noticed in Vol. XXVII, p. 273 *et. seq.*, we have since detected specimens of HYLOBATES AGILIS and GAZELLA DORCAS (*verus*).†

13. Capt. Jethro Fairweather. A fine collection of corals from Singapore; and the skull of a DELPHINUS from the Bay of Bengal.

14. Major R. C. Tytler, of the late 38th N. I. Skull of a DELPHINUS (*minus* the lower jaw), procured westward of the Cape of Good Hope: also the skull of a Camel.

\* It may be remarked that there are two very distinct types of Ostrich-eggs. One is the ordinary egg, with numerous very conspicuous pores on the surface of the shell. The other has no trace of these pores, is generally smaller, and has a smooth and highly polished surface. I have heard it confidently stated, that the latter only are found in southern Africa, while both sorts are brought from the northern portion of that continent. Are there, as the Prince of Canino suspected, two species of Ostrich? And does the smooth-shelled egg appertain to the race of Mesopotamia in the days of Xenophon, that yet lingers in the Syrian desert, and may still occur plentifully in the proximate part of Africa?

† I now recognise the Egyptian Gazelle as *G. DORCAS*; the Arabian (frequently brought to Calcutta from Aden) as *G. CORA*; and the Indian as *G. BENNETTII*.

15. The Rev. H. Baker, Junr., of Mundakym, Alipi, Southern Malabar. A donation of the following specimens from that vicinity.

### MAMMALIA.

**PRESBYTIS CUCULLATUS**; *Semnopithecus cucullatus*, Is. Geoffroy (badly figured in the *Atlas* to Belanger's *Voyage*): *S. jubatus*, Wagner (in Schreber's *Supplement*, a much better figure): *S. Johnii* apud Martin. The great black Monkey of the Nilgiris and Malabar ghâts, which has been much confounded with **PR. JOHNII** (verus), also of the Malabar ghâts, and to which the following synonyms apply:—*Simia Johnii*, Fischer, —*Semnopithecus hypoleucos*, nobis, *J. A. S. X.*, 839,—and *S. Dussumieri*, Is. Geoffroy. The latter species, or true **JOHNII**, is described as a variety of the **JOHNII** by Mr. Martin, who erroneously refers the great black species of the Nilgiris and Malabar to the same. "The cry of *woo-woo*," remarks Mr. Baker, "heard in the Malabar jungles, was supposed by Mr. Ogilby to intimate the presence of some Gibbon (*Hylobates*); but it is simply the call of the **PR. CUCULLATUS**. The Lion Monkey (true **SILENUS**)," he adds, "is found up to Goa and all through the hills, but only in the lonely dense forests; the call of the male is precisely the 'cooyeh' of a native who has lost his way and is shouting for help."\*

**LORIS GRACILIS**, (Geoffroy). Imperfect flat skin.

**RHINOLOPHUS AFFINIS** (?), Horsfield (*vide J. A. S. XXI*, 346); a dark-coloured specimen; and **NYCTICEJUS TEMMINCKII**, also dark-coloured—as in fact are most of the skins of mammalia from Malabar and Travancore.

Flat skins also of **VIVERRICULA MALACCENSIS**, **HERPESTES FUSCUS**, **H. GRISEUS**, **FELIS CELIDOGASTER** (*v. viverrina*, &c.), **F. BENGALENSIS**, and **F. CHAUS**; and a skull of **LUTRA NAIR**, undistinguishable from the common Gangetic Otter referred to *L. sinensis*, Gray, *v. tarayensis*, Hodgson.

Of **FELIS CELIDOGASTER**, Mr. Baker remarks—"This wild Cat grows very large and often kills *pariâ* Dogs, and I have known instances of slave children (infants) being taken from the huts. I scarcely believed the fact, till a very large one was traced up after badly injuring a child from which it was beaten off, and in the act of killing a young calf. **F. CHAUS** is very common." In Bengal the **F. CELIDOGASTER** is mainly a

\* In a subsequent letter, Mr. Baker writes—the **PR. CUCULLATUS** "is found in all the Travancore and Cochin woods, also the Nilgiris and Pulneys; but the *Vella Munthee*, the other **PRESBYTIS** of S. India, replaces it in the plains of Malabar and Coimbatore, and is called Hunumân by the Hindus here, though they also reverence the Toque, **MACACUS RADIATUS**."

fishing Cat; and its habits were erroneously assigned by Buchanan Hamilton to *F. BENGALENSIS*, for which he mistook the species. A newly caught male, however, in my possession, broke through the partition which separated him from a tame Leopardess considerably larger than himself, and killed her during the night. Of *F. CELIDOGASTER*, I have seen several adults quite tame and gentle, and suffered even to range loose about a room; but I never knew either *F. BENGALENSIS* or *F. CHAUS* to be tameable in the slightest degree, however early in life the attempt had been made. A propensity for dabbling and seeking their prey in water is manifested by the kittens of *F. CELIDOGASTER* at a very early age.

"On the Nilgiris," remarks Mr. Baker, "I saw two distinct Otters, one the large brown NAIR, and the second not half so large, almost black on the back and white underneath, and said to be common in the Pykarra river. I could not procure a specimen." Probably one of the *AONYX* group of Otters. "The hill people mention also some creature which lives in holes in the banks of streams in the mountains, with a flat tail; some describe it as a smaller Otter, others as a Rat, and as large as a small terrier. They dive in the water, and are said to live on Crabs and Worms."\*

*SOREX SERPENTARIUS*, Is. Geoffroy. A species which appears to be this, but of a much paler and more delicate grey colour than I have before seen, with hardly a trace of the rufous tips to the fur, is sent as the ordinary 'Musk Rat' of Malabar. The specimen is from Tinnevely. "It is not common," remarks Mr. Baker, "on the Malabar coast, but very much so on the other side; the specimen has lost all smell now [by no means], but is perfectly foetid when alive." As compared with the common *S. CÆRULESCENS*, the present species is much smaller, with the limbs only half as large in proportion, and a much more slender tail; the teeth are also much smaller, and the superior *quasi*-incisors much less hooked. *S. HETERODON*, nobis, from the S. E. Himalaya, is nearly affined, but the teeth are considerably larger in proportion and are of a deep buff-yellow colour, whereas in *S. SERPENTARIUS* they are pure white. *S. HETERODON* appears also (on present evidence) to be rather a smaller species, with

\* Mr. Baker since writes—"The small Otter, of which I got a good view in the Ootacamund museum, is not half the size of the other, and is black on the back with a white belly. This must be the animal I told you the natives spoke of in the hill streams." Seemingly an undescribed species.

Again, he since started a pair of the "small Nilgiri Otter" in the western ghâts; but the eagerness of his companions seems to have occasioned their escape.

proportionately stouter limbs; but I doubt if I have seen a full grown specimen.

S. (?) *VIRIDESCENS*, nobis, *n. s.* A flat skin, tail-less, and with only one hind-foot attached, but nevertheless recognisable as certainly distinct from *S. SONNERATII*, not only by its colouring and quality of fur, but by having the hind-foot to heel  $1\frac{1}{8}$  in. long, whereas that of *SONNERATII* is barely  $\frac{1}{8}$  in. Length to base of tail about  $5\frac{1}{2}$  in. Colour very dark; fuliginous on the face to beyond the ears; and the upper-parts slightly, the lower very conspicuously, tipped with yellowish, which imparts a dingy greenish aspect, whence the name. Fur unusually short and close, approximating the velvety character of that of the Mole. Perhaps a new genus of *Soricidæ*. Mr. Baker remarks that this is "the common species of Southern Malabar, the bite of which the natives dread as poisonous.\*

\* Major Tytler has permitted me to examine four species of *SOREX*, more or less well preserved in spirit, from his collection.

1. *S. SOCCATUS*, Hodgson, nobis, *J. A. S.* XXIV, 30, and *Ann. Mag. N. H.*, 2nd series, XVII, 17. From the Másuri hills. Length of head and body 5 in.; of tail 3 in.; and hind-foot to heel  $\frac{1}{2}$  in. This is larger than hitherto recorded; but I do not hesitate in identifying the species.

2. *S.* ———? Length of head and body 2 in., of tail  $1\frac{1}{2}$  in.; hind-foot to heel  $\frac{7}{8}$  in. Colour slaty-brown throughout, a little canescent below. The *quasi*-incisive teeth particularly large and strong. In bad condition. Másuri.

3. *S.* ———? One of the minute species, from the same locality as *S. MICRONYX*, nobis; but of a much darker and more fuscous brown colour above, dingy canescent below, and the tail longer and more slender, containing 17 or 18 vertebræ: ears smaller and thinner than in *S. MICRONYX*; and the *quasi*-incisors larger. Length of head and body  $1\frac{1}{2}$  in.; tail  $1\frac{5}{16}$  in.; hind-foot to heel nearly  $\frac{3}{8}$  in. Másuri.

4. *S. TYTLERI*, nobis, *n. s.* A remarkable species from the Deyra doon, of a light rufescent sandy-brown colour, unusually well clad, even on the feet and tail, the last being densely covered with a shortish fur, having numerous long hairs intermixed. Fur of the body dusky for the basal two-thirds or more, and tipped with the hue described; the upper-parts being more rufescent, the lower slightly paler: form unusually robust, the basal portion of the tail exceedingly thick. The larger of two specimens, a female, measures—head and body  $4\frac{1}{2}$  in., the tail  $2\frac{3}{4}$  in. Hind-foot to heel  $\frac{7}{8}$  in. I do not think it full-grown, though Major Tytler has not seen any of larger size.

The following new species of typical *SOREX* is from China (Amoy).

*S. SWINHOEI*, nobis. Of an uniform duskyish mouse-colour, tinged below with cinereous; the ear-conch unusually large; and the fur close and velvety, or Mole-like. Length of head and body  $3\frac{3}{4}$  in., of tail 2 in.: hind-foot  $\frac{3}{4}$  in. Presented to the museum by R. Swinhoe, Esq., of H. M. Consulate, Amoy.

Some time ago, Mr. Baker asserted in a communication to a sporting periodical his belief that a real Mole existed in his neighbourhood!\* He now writes:—"I have since had three specimens of the Mole brought me, but all too far gone for preservation; they were perfectly black with white belly. Moles they certainly were." It is unfortunate that the skulls were not preserved, or even the entire skeletons in spirit; but I trust ere long to receive examples from Mr. Baker, as a *TALPA* from S. India would be a very unexpected discovery; though, as stated in the sequel, we possess the *T. LEUCURA*, nobis, from the hilly region bordering on the valley of the Sitang river in British Burma, where co-existing with a *TUPAIA* and a *HYLOMYS*!†

*PTEROMYS PETAURISTA*, (Pallas); and *SCIUROPTERA FUSCOCAPILLA*, Jerdon, nobis, *J. A. S.* XVI, 867. "The common Flying-squirrel [*i. e.* the *Pteromys*] grows much larger than the specimen sent, and they are perfect plagues in cocoa-nut gardens. The brown ones are mother and young, and were taken from a hollow tree; they lived some days, but bit those attempting to feed them so savagely, that they were killed, to my great regret." The latter species has hitherto been only known from the description cited, of a little more than half-grown specimen in rather abraded *pelage*, and the condition of that specimen induced the imposition of a not very appropriate name. Unfortunately, the adult now sent is tail-less, though otherwise in good order; and the tail of the young corresponds with that described formerly. The species most nearly resembles the *Sc. FIMBRIATA*, Gray, of the Simla and Másuri hills, but has much smaller ears, and the fringe of long hair bordering the hind-foot (from which *Sc. FIMBRIATA* takes its name) does not exist in the present animal. Fur very dense and soft, that of the upper-parts dusky-ash for the basal two-thirds, the rest a rich brown with black tips: towards the tail it inclines to be woolly; on the crown it is more fuscous, having whiter tips; and the parachute-membrane is mostly blackish above, with a pale edge: lower-parts

\* "Going through the hills, I often come upon a small black velvet-coated creature, dead, with the head bitten off. The paws are precisely like those of the English Mole, with a similar tail; the whole a finger's length and about an inch thick. It would be curious to know what kills this animal and whether it be a true Mole, as I think it."

† In a subsequent letter, Mr. Baker remarks—"With the assistance of the hill-people we contrived all kinds of springes, trap-falls, &c., in order to catch the smaller animals; but we could not manage a common Mole-catcher's trap, and I was fairly beaten by a *digger* whose runs reminded me of those of the Mole at home. He seemed to beat us by his *mining*, perhaps however by the numerous ramifications of his burrow."



rufescent-whitish, inclining to pale ferruginous round the border: feet light brown: moustaches long and black. The young is essentially similar, with tail indistinctly distichous, reaching (*vertebræ*) when reflected to between the ears; brown above, black below medially to near its base, with a slight albescent tip. Length of adult female, to base of tail, 10 in.; of hind-foot (with claws) 2 in.; of ear-conch (posteriorly)  $\frac{1}{2}$  in.: in front of and behind the ears are numerous long fine dusky hairs.

"The Flying-squirrels," remarks Mr. Baker, "being nocturnal animals, are difficult to procure, except by watching under fruit-trees in moonlight-nights, or, when a forest is cut down, by observing the hollow trunks and securing their tenants. The noise made by these creatures at night in the depths of the old jungles, is sometimes alarming to a stranger to it."\*

*SCIURUS MAXIMUS* (P), Schreber, apud Horsfield; but certainly not the *Bombay Squirrel* of Pennant, which seems rather to be *SC. ELPHINSTONEI*, Sykes; while the corresponding animal of Central India, so abundantly brought alive to Calcutta, is intermediate, and is always black on the upper half of the fore-limbs, but with never any black upon the croup or hind-limbs. The Southern Malabar specimens sent by Mr. Baker have the entire shoulders and upper half of the fore-limbs, and also the entire croup and haunch, black, advancing medially so as almost or quite to meet the black on the shoulders. Of hundreds of the large Squirrels from Central India, I have observed no variation worthy of remark. But these gigantic Squirrels are equally puzzling with the great Flying-squirrels (*PTEROMYS*).

The stuffed skin and skeleton of one in the Calcutta Medical College appears to be of an undescribed race:—

*SC. ALBIPES*, nobis, *n. s.* Like *SC. MACROURUS*, Pennant, but of an uniform dull brown colour above and on the outside of the limbs down to the feet, the fur very obscurely grizzled, except with whitish on the anterior half of the head. Paws whitish, with black hairs intermixed upon the toes. Lower-parts uniformly white, abruptly defined. Ears blackish externally, with no pencil-tufts. Tail dusky-brown, with a dull

\* I extract the following notice from some 'Notes on Shooting in Kashmir,' descriptive of the haunts of some species either of *PTEROMYS* or *SCIUROPTERA*,—probably the former, and the particular species *PT. INORNATUS*, Is. Geoff. "There are numbers of Flying-squirrels to be got in the forests about Wurdwán; they live in the tops of the dead fir-trees, where they make a round hole in the bark and hollow out a nest for themselves inside. On scraping with a stick at the bottom of a tree, the animal pops out its head like an Owl," and is then easily shot. *Indian Sporting Review*, *n. s.* I, 35.

white mesial line below. In other respects like *Sc. MACROURUS* of the southern parts of India and Ceylon. However the latter may vary, the fore-limbs from the elbow are invariably white, and also a corresponding portion of the hind-limbs; the crown is blackish, with white muzzle and white occipital patch; and there is a great admixture of white on the tail, either merely tipping the hairs more or less, or rarely almost the whole tail is white or yellowish-white. There is commonly also much white grizzling the sides of the body. From the dark limbs more especially, I take that now described to be of a particular race, equivalent to many others that are named; but the *habitat* remains to be ascertained.

Fam. *Myoxidæ*, Waterhouse.

*PLATACANTHOMYS*, nobis, *n. g.* A most remarkable new genus, having essentially the dentition, form of skull, and also the hirsute tail of a *Dormouse* (*MYOXUS*, *GRAPHIURUS*), but the upper-parts are densely covered with sharp flat spines, mixed with an exceedingly delicate, thin, and somewhat frizzled under-coat; with spines also on the lower-parts, but these much smaller and finer (more resembling those on the upper-parts of *MUS PLATYTHRIX*), and the soft under-coat there predominating; with no spines on the head and throat, limbs, and hind-portion of the abdomen, but the hair on the forehead and occiput full and tufty, each hair being flattened and the series passing gradually backward into spines. The skull could not be taken out without injury to our only specimen, but on the skin being relaxed and reversed, all doubt was completely removed respecting the affinity of this curious animal. The grinders, however, are only three in number, above and below, of equal size, excepting that the last above is one-third smaller than the rest; each is surrounded with enamel, with three or four transverse folds of the same, comparable to those of the grinders of an Asiatic Elephant, only simple and contiguous or very nearly so. The descending angle of the lower jaw quite resembles that of *SCIURUS*; but the coronoid process is obtuse. From what little remains of the skull, it would seem to resemble very nearly that of *GRAPHIURUS* (vide Waterhouse in *Mag. Nat. Hist.*, *n. s.*, III. 1839, p. 185), but the nasal bones do not contract posteriorly, and the inter-orbital space is also less contracted. Ant-orbital foramen as in *MYOXUS*, but the maxillary process which forms its outer wall is less than half as broad as in *MYOXUS*, or more as in *GRAPHIURUS*. Rodential tusks quite similar to those of *MYOXUS GLIS*. Comparing the feet with those of the latter animal, the structure is seen to resemble, except that in the new genus, the hallux is less developed and is nailless. The tail, too, is less hirsute on its basal third, the hairs becoming gradually longer from the base to the middle and being of equal length for the remainder; they are thinner

and coarser than in *MYOXUS*, straight, and arranged distichously, so that the hairy tail is flat as in *SCIUROPTERA*, and its lower surface is equally well clad with the upper. The whiskers are very long, some of them reaching to the middle of the body; and the soft frizzled fur of the lower-parts resembles that on the under-parts of *MYOXUS GLIS*, only mingled (except towards the throat and vent) with rudimentary spines. I can detect only two pairs of (abdominal) mammæ.

*PL. LASIURUS*, nobis, *n. s.* Size nearly that of *MYOXUS GLIS*; but the head smaller and shorter: a female measuring 6 in. or nearly so to base of tail, the tail (vertebræ)  $3\frac{1}{2}$  in., or to end of hair  $1\frac{1}{2}$  in. more: ear-conch (posteriorly)  $\frac{1}{2}$  in., ovoid, and all but naked: hind-foot to heel 1 in.: longest whiskers  $2\frac{1}{2}$  in., becoming exceedingly fine towards the extremity. General colour above (that of the tips of the spines) a somewhat light rufescent-brown, similar to that of the spines—as distinguished from the quills—of various Porcupines, only less intense; the thin slightly frizzled under-fur being paler. The spines are  $\frac{5}{8}$  in. long, like stiffish thin laminæ of *baleen* or ‘whale-bone;’ they gradually taper to a sharp point from the middle, and abruptly at the extreme base or point of attachment; being white, excepting at the tips which constitute the surface. On the forehead and crown, where the hair is very full (as before described), the colour is more rufescent than otherwise; whiskers chiefly black; and the lower-parts are dull or subdued white. The hairs on the tail are much darker than the body-colour, and may be described as infuscated, except at the tip of the tail where they are dull white throughout their length, forming a conspicuous pale tail-tip.

“I was ignorant of the existence of this animal,” remarks Mr. Baker, “till about a year ago, when I found it in a range of hills about 3000 ft. high. It lives in the clefts of the rocks and hollow trees, is said to hoard ears of grain and roots, seldom comes into the native huts, and in that particular neighbourhood the hill-men tell me they are very numerous. I know they are to be found in the rocky mountains of Travancore, but I never met with them in the plains. I have some hundreds of these hill people baptized Christians, and shall have no difficulty in procuring you specimens, including one preserved in spirit.”\*

\* In a letter received as the above was going to press, Mr. Baker has favored us with a notice of the habits of this species, which helps to confirm the propriety of its allocation among the Dormice. He remarks—“I have been spending the last three weeks in the ghâts, and among other things had a great hunt for the new spiny Dormice. They are most abundant, I find, in the elevated vales and ravines, living *only* in the magnificent old trees there found, in which

Of *Muridæ* two species are sent. A flat skin of the common *Mus FLAVESCENS*, Gray; and two ditto, sent as the 'Black Rat,' but not affined to *M. RATTUS*, L.: so far as can be judged, they resemble *M. INDICUS* in size and proportions, including length of tail; but the coat is different both in texture and colouring. In *M. INDICUS* the *pelage* is coarse and harsh, of an ordinary rat-brown colour, and quite devoid of gloss. In the Malabar animal sent, the *pelage* is soft and glossy, and very dark in colour—almost black on the face. On the back the hairs are ashy-black with slight ruddy-brown tips; on the sides and under-parts those tips are more extended and yellowish. Whiskers black. Perhaps only a dark southern variety of *M. INDICUS*.\*

they hollow out little cavities filling them with leaves and moss. The hill-people called them the 'Pepper Rat,' from their destroying large quantities of ripe pepper (*Piper nigrum*). Angely and jack fruit (*Artocarpus incisa* and *integrifolia*) are much subject to their ravages. Large numbers of the *Shunda* palm [*Borassus*?] are found in the hills and *toddy* is collected from them: these Dormice eat through the covering of the pot as suspended, and enjoy themselves. Two were brought to me in the pots half-drowned. I procured in one morning sixteen specimens. The method employed in obtaining them was to tie long bamboos (with their little branches left on them to climb by) to the trees, and when the hole was reached the man cut the entrance large enough to admit his hand, and took out the nest with the animals rolled up in it, put the whole into a bag made of bark and brought it down. They actually reached the bottom sometimes without being disturbed; it was very wet cold weather, and they may have been somewhat torpid; but I started a large brown Rat at the foot of one of the trees, which ran up the stem into a hole, and four Dormice were out in a minute from it, apparently in terror of their larger friend. There were no traces of any hoarding in any of the holes, but the soft bark of the trees was a good deal gnawed in places. I had two of these Dormice alive for some time, but as they bit and gnawed at everything intended to keep them in durance, I was obliged to kill both. I noticed that when their tails were elevated the hairs were perfectly erect like a bottle-brush. I prepared you twelve skins with the skull in each of them complete, and two complete skeletons; but the latter were lost with the box containing them in crossing a stream, the cooly being carried off his legs. I hope before long to replace this loss. The skins I will send you shortly by banghy."

\* Mr. Baker since writes—"This species replaces on the hills the *Mus providens* or *indicus* of Mr. Elliot (I think), for that is very common on the plains but is not found in the hills, though the habits of both are precisely as described by Mr. Elliot."

Of *Leporidae*, Mr. Baker asserts that the *LEPUS RUFICAUDATUS*, in addition to *L. NIGRICOLLIS*, inhabits his neighbourhood; also the true Hog Deer (*CERVUS PORCINUS*), of which Dr. Kelaart presented a living male from Ceylon, where known as the 'Paddy-field Deer' (his *C. oryzae*).\*

ELEPHAS. "Section of a process taken from the head of a Malabar wild Elephant having perfect tusks." A remarkable concretion of ivory, taken probably from the tusk-socket, 4 in. long by 2 in. across where widest.

KEMAS HYLOCRIUS, Ogilby. *P. Z. S.* 1837, p. 81: *Capra (Ibex) warryato*, Gray, *Ann. Mag. N. H.*, X (1842), 267. "Warra-ardu or 'Precipice Goat.'" (Baker.) 'Ibex' of Nilgiri sportsmen. The skull of an adult male, with fine arched horns, measuring 15 in. round the curvature. "The Ibex-skull I send," remarks the donor, "I intended to have sent with his skin. The animal, when alive, was as large as an ordinary [Indian] Donkey, and so heavy that six men could with difficulty bring him in. Back almost black, sides brown, legs grizzled with white. Unfortunately the skin was quite spoiled, though it had been beautifully taken off. The female has only two teats.† They are very numerous, feeding like a flock of Sheep on the hill-tops, and only flee to the precipices when alarmed. They will even hide in jungle and grass. There is a solitary Roman Catholic church on a rock in the jungles, on the borders of Travancore and Cochin, where the wild 'Ibex' are common, and though numbers of people go there on pilgrimage these 'Ibex' walk about among them and eat the sesamum-seed given them, but do not allow themselves to be touched. They are considered holy and belonging to the church." Elsewhere the same observer remarks, writing of the game animals of the western ghâts, that—"If the mountains are at all rocky and precipitous, you will find the wild Goat or 'Ibex' close to the rocks, often in large herds, \* \* \* I have occasionally seen some of these animals much smaller than the usual size, and somewhat shaggy as to their colouring. Sportsmen in the Pulneys and Ghâts near Cape Comorin talk of a wild Sheep. I think it is probable." Scarcely so: though we do read of a "wild Sheep" as abounding in the highlands of Madura;‡ and

\* Vide note to p. 297.

† This also is stated in a *MS.* description which the Hon'ble Walter Elliot favored me with many years ago; whereas the nearly affined *Tehr* and *Goral* of the Himalaya have four developed teats. The Nilgiri animal has commonly two young at a birth, or at least the females are usually seen followed by two kids.

‡ Thornton's *Gazetteer of India*. Art. Madura; which province must not be confounded with the island so named that is close to Java.

I doubt if this refers to the 'Jungle Sheep' of Madras sportsmen (what Mr. Ogilby very naturally concluded the Nilgiri 'Ibex' to be), which is no other than the Muntjac, the *Kákur* or 'Barking Deer' of Himalayan sportsmen, and the 'Red Deer' of those of Ceylon! As an article of provender, Mr. Baker remarks, that "a quarter of 'Ibex,' hung as the country people in the mountains do at home, within a wire or muslin bag and exposed to the air, is equal to Welsh mutton." We have now to ascertain what the reputed 'wild Sheep' of the highlands of Madura is intended to mean: in all probability our present animal, rather than any other.

#### AVES.

Of birds, we are indebted to Mr. Baker for a few specimens, among them being the head of a young *BUCEROS CAVATUS*, and a good skin of *B. GINGALENSIS*. He enumerates the four species of Hornbill that inhabit the peninsula of India, viz. *CAVATUS*, *PICA*, *BIROSTRIS*, and *GINGALENSIS*; and remarks that "in all, the female is shut up with the eggs, and plasters up the entrance to the nest *with its ordure* [?]: the male feeds both mother and young. A few days since I took the mother (*B. GINGALENSIS*) out of its hole; it had stripped most of the feathers off its breast, was very weak, and had three white eggs.\* The roar of the *CAVATUS* I have often noticed strangers to the forest to be so alarmed at, as to fly as if from some terrible enemy.

"The habits of the Hornbills are very similar to those of the South American Toucans. A friend had a large tame *CAVATUS*: it watched a female terrier that had young, and in two days managed to steal and swallow three pups during her absence. Its usual food was rice and plantains." It is curious to see them feed on boiled rice. A large *CAVATUS* will pick it up grain by grain, and successively toss each grain into the air and catch it in its throat. This I have often witnessed.

The other bird-skins sent are *MEGALAIMA VIRIDIS*, *OXYLOPHUS JACOBINUS*, *DENDROCITTA LEUCOGASTRA*, *MYIOPHONUS HORSFIELDI*, *BRACHYURUS TRIOSTEGUS*, *MERULA NIGROPILEUS*, *GEOCICHLA CYANOTUS*, *TCHITREA PARADISI*, *DICRURUS LONGICAUDATUS*, *CHALCOPHAPS INDICUS*, and *GALLUS SONNERATII*.

Examples also of the gigantic Spider, *MYGALE AVICULARIA*; which, Mr. Baker remarks, is "common in the hills. They live among stones and old bark, and are really savage creatures and poisonous too, being easily excited, when they spring upon an exposed limb and bury the fangs in the flesh in an instant. I have *seen* cases followed by fever and much inflammation. The Tamil name is *Tella mundalum*."

\* *Vide* also Tickell, in *J. A. S.* XXIV, 279; and Dr. Livingstone.

16. From the late Major Berdmore, of Schwe Gyen, in the valley of the Sitang river, Tenasserim provinces.\* Two considerable collections, consisting chiefly of small mammalia, reptiles, and fishes, preserved in spirit, and comprising several species of much interest and many hitherto undescribed.

### MAMMALIA.

*MACROGLOSSUS MINIMUS*, (Geoffroy). The Kiodote. The smallest of *Pteropodine* Bats (or 'Flying Foxes'), hitherto only known from the archipelago, with the exception of an example from Siam noticed by Dr. Horsfield, as "perhaps a distinct species, with a lengthened nose,"—this character being remarkable in the Tenasserim specimen.

*SCOTOPHILUS FULVIDUS*, nobis, *n. s.* A small *SCOTOPHILUS*, (having two pairs of minute upper incisors,) of a pale fulvous colour throughout, with black membranes. Length  $2\frac{3}{4}$  in., of which tail 1 in.; expanse  $7\frac{1}{4}$  in.; fore-arm  $1\frac{1}{8}$  in.; and ear-conch (posteriorly)  $\frac{5}{16}$  in. Four specimens (females).

*SC. COROMANDELIANUS*, (F. Cuv).

*MYOTIS* — ? Resembles *M. PIPISTRELLUS* in size and structure, but is of a dark fuscous hue, the fur slightly tipped with earthy-brown on the upper-parts, and much more largely tipped with a paler (almost whitish) brown below; membranes dusky. Length  $3\frac{1}{4}$  in.; of which tail  $1\frac{1}{2}$  in.;

\* We have to deplore the loss of this most energetic officer, to whom the Society has been very largely indebted for specimens in different branches of zoology for several years past; during which period he has enriched the museum to a far greater extent than any other contributor, and has been remarkably successful in procuring novelties of more than average interest. The present Report will alone amply show how industriously our lamented friend exerted himself to enrich the Society's collections, and how great therefore is the loss sustained by his decease. His friend the Commissioner of Pegu wrote, (May 31st) — "You will be sorry to hear that our friend Berdmore is no more. He was truly an excellent fellow. He had quite worn himself out by hard work. I received news of his death yesterday by telegram." It was at the request of Col. Phayre, many years ago, that Major (then Captain) Berdmore first devoted his attention to collecting specimens for the Society's museum; and whatever he could procure and preserve in spirit, he lost no opportunity of forwarding, and generally in excellent condition. Formerly in the little explored province of Mergui, and since in the valley of the Sitang river and adjacent hills, as little trodden by the naturalist, our deceased friend had better opportunities than fall to the lot of most people of procuring objects of more than ordinary interest.

expanse  $9\frac{3}{4}$  in.; fore-arm  $1\frac{1}{2}$  in.; ear-conch (posteriorly)  $\frac{1}{2}$  in. Three specimens (females).

*RHINOLOPHUS AFFINIS*, Horsfield (*verus*, *apud* Schinz; *nec apud* Cantor?).

*HYLOMYS PEGUENSIS*, nobis, *n. s.* So nearly resembling the *H. SUL- LUS* of the archipelago, figured and described by Dr. S. Müller, that I should have considered it identical, were it not for the greater development of tail. Total length 6 in.; of which tail  $\frac{7}{8}$  in.; head  $1\frac{3}{4}$  in.; ear (posteriorly),  $\frac{1}{2}$  in.; and hind-foot with claws, 1 in. Adult male and female. Hitherto this genus was supposed to be peculiar to the archipelago.

*TALPA LEUCURA*, nobis, *J. A. S. XIX*, 217. The Sylhet Mole, now for the first time obtained so far south, and very remarkable as inhabiting together with the *HYLOMYS*.

*SOREX NUDIPES*, nobis, *J. A. S. XXIV*, 34.

*SCIURUS KERAUDRENI*, Lesson.

*SC. BELANGERI*, Lesson.

*RHIZOMYS SUMATRENSIS*, (Raffles).

*MUS ROBUSTULUS*, nobis, *n. s.* A stoutly formed Rat, with tail not quite so long as the head and body, which latter measure together about 6 in. Colour much as in *M. DECUMANUS*, but the feet conspicuously whitish. Tail with short setæ of equal length throughout—not becoming longer towards the tip.

*M. CINNAMOMEUS*, nobis, *n. s.* Like *M. FLAVESCENS* but smaller, with proportionally longer tail, and softer fur of a fine cinnamon-colour (nearly as in *M. OLERACEUS*), with inconspicuous black tips; the under-parts white, which is abruptly divided from the cinnamon hue above. Length of head and body about 6 in., the tail  $7\frac{3}{4}$  in., and hind-foot  $1\frac{1}{4}$  in.

*M. FLAVESCENS*, Gray (?), *var.?* A Rat very like *M. FLAVESCENS*, but of a darker and much less rufescent hue above, would seem to abound in Pegu and the Tenasserim provinces, and probably in the Malayan peninsula; for we have a specimen of what appears to be the young of this race from Malacca. It is probably the *M. FLAVESCENS* of Dr. Cantor's Catalogue of Malayan animals; and the *M. BERDMOREI*, nobis, should perhaps be referred to it, but of this I do not feel confident at present.

*MUS* — ? Very like the young of *M. NEMORALIS*, nobis; but the great development of the *testes* of the male would seem to indicate an adult. Head and body 4 in.; tail  $4\frac{1}{4}$  in.; and hind-foot  $1\frac{5}{8}$  in.

*M. NITIDULUS*, nobis, *n. s.* A house Mouse apparently, with tail equal to the head and body, and uniformly furnished with minute setæ to the end; ears large and ample. Total length  $6\frac{1}{2}$  in.; hind-feet a little exceeding  $\frac{3}{4}$  in.; and ears (posteriorly)  $\frac{9}{16}$  in. Colour nearly that of *M.*



DECUMANUS, with the under-parts subdued white tolerably well defined. Of the same subgroup as *M. MUSCULUS* and *M. MANEI*.

*M. CONCOLOR*, nobis, *n. s.* A house Mouse probably, of an uniform dark greyish 'mouse-colour' above and below; eyes of medium size, and ear-conch moderately ample; feet large, and the tail with close rings of minute setæ throughout. Length 3 in., of tail 4 in., and hind-foot  $\frac{7}{8}$  in. From the large proportional size of the limbs, it is probably not full-grown.

*M. BADIUS*, nobis, *n. s.* Like *M. OLERACEUS*, Sykes, but the eye fully twice as large, and black whiskers; colour of the upper-parts a more rufous chesnut or cinnamon hue; of the lower-parts white almost pure. Length of a female 3 in. to base of tail, the tail  $4\frac{3}{8}$  in., and hind-foot  $\frac{5}{8}$  in.

*M. PEGUENSIS*, nobis, *n. s.* A field Mouse, with tail longer than the head and body, well clad with hairs that become longer to the end. Length to base of tail  $3\frac{1}{8}$  in., of tail  $3\frac{7}{8}$  in.; ear-conch  $\frac{1}{2}$  in.; and hind-foot  $\frac{3}{4}$  in. These are the measurements of a female in spirit. A stuffed male has the tail (vertebræ)  $4\frac{1}{2}$  in. Fur very full and dense, pale yellowish-brown on the upper-parts, slightly yellowish white below: whiskers remarkably long.\*

\* Some other Mice in spirit have been sent by Major Tytler for identification. They are as follow:

*MUS NIVIVENTER*, Hodgson, *Ann. Mag. N. H.* XV. (1845), p. 267. A well marked species, rather larger than as originally described. A male measuring 6 in. long, with tail 7 in.; and hind-foot nearly  $1\frac{1}{2}$  in.: female even larger, or 7 in. long, with tail  $7\frac{1}{2}$  in. From Másurí.

*M. OLERACEUS*, Sykes: Syn.? *M. (Vandileuria) dumeticola*, Hodgson, *ibid.* p. 268. I cannot perceive in what these differ. A specimen from Asám is very slightly deeper-coloured, but I can detect no further difference. A Deyra doon example measures  $2\frac{7}{8}$  in. long, with tail  $4\frac{1}{2}$  in.

*M. HOMOURUS*, Hodgson, *ibid.* p. 268. Accords with the description, except that the largest of several specimens does not quite come up to the dimensions stated. The males measure  $3\frac{1}{8}$  in. to base of tail, and tail the same (having about 24 vertebræ); hind-foot plus  $\frac{5}{8}$  in. I have been unable to satisfy myself of the number of teats. Mr. Hodgson states—"It has eight teats only in the females. The other Mice have ten, and the Rats have twelve." As compared with the European *M. MUSCULUS*, the fur is much more Gerbille-like in character, the piles less dense and sinuous.

*M. CRASSIPES*, nobis, *n. s.* Like the preceding, but with the tail rather longer than the head and body. Length  $2\frac{3}{4}$  in.; tail  $3\frac{1}{4}$  in.; hind-foot  $\frac{3}{4}$  in. The feet particularly large, and, like the tail, well furnished with coarse short setæ. From Másurí.

**HAPALOMYS**, nobis, *n. g.* A very distinct new genus of *Muridæ*, with long and delicately fine *pelage*, and exceedingly long tail, the terminal fourth of which is remarkably flattened and furnished with hair more developed than in perhaps any other truly *Murine* form. Limbs short, with the toes remarkably corrugated underneath, the balls of the ungual phalanges greatly developed, protruding beyond the minute claws of the fore-feet, and equally with the more developed claws of the hind-feet. Head short; the ears small and inconspicuous. The skull approaches in form that of *MUS INDICUS*; but the rodential tusks are broader and flatter to the front: molars as in the *Muridæ* generally, but much worn in the specimen under examination; they are considerably less directed outward than usual, and the bony palate has therefore the appearance of being narrow: the super-orbital ridges project much outward, in form of a thin bony plate; and there is a considerable process at base of the zygoma anteriorly, and posterior to the ant-orbital foramen: zygomata broad and compressed about the middle.

**H. LONGICAUDATUS**, nobis, *n. s.* Length of male  $5\frac{3}{4}$  in. to base of tail, of tail  $7\frac{1}{4}$  in.; of female  $5\frac{1}{4}$  in., with tail  $7\frac{1}{2}$  in.: sole  $1\frac{1}{8}$  in.: ears posteriorly  $\frac{1}{4}$  in., rounded, and scantily fringed with fine long hairs. Fur long and soft, measuring about  $\frac{5}{8}$  in. on the upper-parts, slaty for the basal two-thirds, then glistening brown with black tips, and a few long hairs of very fine texture interspersed: lower-parts dull white. Whiskers black, long and fine; and there is a tuft of fine blackish hair anterior to the ears.

Specimens of adult male and female, with a young one, were forwarded by Major Berdmore.

**CERVUS (PANOLIA)** — ? *C. frontalis* apud Cantor. The *T'hâmine* Stag, found also in the Malayan peninsula: an exceedingly fine head; the horns differing as usual from *Mânipur* specimens by being shorter,

**M. TYTLERI**, nobis, *n. s.* Length  $2\frac{3}{4}$  in., tail the same, having about 24 vertebræ; hind-foot  $\frac{5}{8}$  in. Fur unusually long and full, of a pale sandy 'mouse-colour' above, isabelline below, and pale on the well clad limbs and also on the tail laterally and underneath. Whiskers exceedingly fine in texture, and of a whitish colour. Male. From the Deyra doon.

**M. MUSCULUS**, L.; from England. On comparing fine specimens of the common English Mouse in spirit with equally fine examples of the Indian house Mouse (*M. MANEI*), it is seen that *M. MUSCULUS* has conspicuously larger ears, much smaller eyes, broader paws, and the tail is one-fourth shorter,—measuring 3 in. in *MUSCULUS* and 4 in. in *MANEI*. The fur again is of very different texture. Accordingly the two species are obviously distinct.

especially the brow-antler, with greater tendency to subdivide at the crown. When series of horns of both races are seen together, the difference is very manifest.\*

Of birds are sent skins of *EURYSTOMUS ORIENTALIS*, *HARPACTES ERYTHROCEPHALUS*, and *LYNCORNIS CERVINICEPS*.

Of reptiles, many interesting specimens, comprising *DRACO LINEATUS*, *ACANTHOSAURA ARMATA*, *CALOTES EMMA* (very fine), *C. VERSICOLOR*, *LEIOLEPIS REEVESII*, *ASPRIS BERMOREI*, nobis (fine), *LISSONOTA MACULATA*, *XENOPELTIS CONCOLOR*, *PYTHONIA (n. g.) SEMIZONATA* (*Homolopsis semizonata*, nobis, *J. A. S.* XXIV, 187), *PARIAS* (D. and B., *nec* Gray) *MACULARIUS*, *n. s.*, *CORONELLA NOTATA*, *n. s.*, *XENODON PURPURASCENS* (several varieties), *LEPTOPHIS ORNATA*, *DIPSAS FERRUGINEA*, *D. (v. AMBLYCEPHALUS) BOA*, *HOMOLOPSIS SIEBOLDII* (!), *H. LEUCOBALIA*, *NAJA TRIPUDIENS* (dark var.), *HAMADRYAS VITTATUS*, and others unnecessary to mention. Also some *Batrachia*, including an *ICTHYOPHIS*, which I am necessitated to leave undetermined for the present.

Of fishes, a very large collection, including numerous new fresh-water species, some of Himalayan types, others akin to those of the plains of India and Lower Bengal. Descriptions of all of them are awaiting publication, but they are far too numerous for introduction in this place. The group of *Cobitidæ* (or Loches), in particular, exhibits an extraordinary

\* Since the decease of Major Berdmore, we have received two more packets from him, one of them containing two flat skins of probably does of the *PANOLIA*. They are of a pale chesnut-brown colour, paler on the sides, white below; spotless with a dark mesial list which in one of the two specimens is scarcely discernible: face and limbs more or less infuscated: the tail, if (as it appears) perfect, very short. Evidently in summer coat. Not unlike *C. DUVAUCELII* in corresponding garb; but the latter is mostly more or less spotted or *menilled*, with especially a row of pale spots along each side of the dorsal list; and there is no infuscation of the face and limbs. Among the Hardwicke collection of drawings in the British Museum is a coloured figure designated as the "Spotted *Bára Sing'ha* of the Sundarbáns." This represents an unusually spotted buck, though I have seen a doe equally spotted; and the species does inhabit parts of the Sundarbáns. As with the Hog Deer, some individuals of the *Bára Sing'ha* are much more spotted than others in the summer costume, and the does are generally more so than the bucks. The most spotted buck of the Hog Deer which I have seen was sent alive from Ceylon by Dr. Kelaart. I think, however, it will be found that the Cinghalese Hog Deer (with which the Malabar species is probably identical) has longer and more *Axis*-like horns than true *C. PORCINUS*, the inner prong of the terminal fork being given off at an acuter angle; the figure of the animal being also somewhat less *Porcine*.

development of species and of well marked generic forms in the mountain streams of Burma.

Also various *Crustacea* and shells, for the most part determined, but an elaborate notice of which cannot be conveniently introduced here.

It remains only to add, that a magnificent pair of horns were exhibited at one of the Meetings, of the great Wapiti Stag (*CERVUS CANADENSIS*), or so-called 'Elk' of the Anglo-Americans, having been lent for the purpose by J. W. Linzee, Esq. The length of the skull, from vertex to tips of intermaxillaries, is  $21\frac{3}{4}$  in.; and breadth of orbits posteriorly  $8\frac{3}{4}$  in. Length of horn, measuring round the outside,  $4\frac{3}{4}$  ft.; circumference of base, immediately about the 'burr' or basal ring,  $12\frac{3}{4}$  in.; and length of brow-antler, 17 in. Greatest width of the horns apart, 3 ft.  $1\frac{1}{4}$  in.; and the tips are 2 ft.  $3\frac{1}{4}$  in. apart. This fine specimen was brought from California.

E. BLYTH.

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FOR AUGUST, 1859.

The Monthly General Meeting of the Asiatic Society was held on the 3rd Instant.

A. Grote, Esq., President, in the chair.

The Proceedings of the last meeting were read and confirmed.

Presentations were received.

1. From the Officiating Junior Secretary to the Government of Bengal, a set of Photographic Drawings of the ancient buildings at Beejapore, sent out by the late Hon'ble the Court of Directors.

2. From the same, two copies of Selections from the records of the Bengal Government, No. 30, containing Reports of the Districts of Pooree and Balasore by Henry Ricketts, Esq.

3. From the Royal Society of London, the Proceedings of that Society.

4. From the Imperial Academy of Sciences in Vienna, several vols. of the Transactions of the Academy.

5. From the Royal Geographical Society of London, the Proceedings of that Society.

6. From the Royal Society of Sciences, Stockholm, Parts 1 to 5, of a Voyage round the world of the Royal Swedish Frigate *Eugenie*.

7. From Major H. B. Lumsden, 60th N. I., late in charge of the Kandahar Mission, the skull and incomplete skin of a *Ghor-Khur*,

(or so called 'wild ass,') from the vicinity of Kandahar. Also specimens of a Lizard from the same neighbourhood, known as the *Rag Mahi* or 'Sand-fish,' the horns of an *Affghan Gazelle*, and some skins of Ducks.

8. From Major S. R. Tickell, Moulmein, a large collection of birds, comprising many species of interest and some novelties, obtained during a trip to the mountainous interior of the Tenasserim Provinces; and, subsequently, a skin of the Pomarine Skua, an arctic bird never previously obtained within the tropics.

9. From Captain Hodge, Commanding the Guard-ship *Sesostris*, at Port Blair, Great Andaman, a highly interesting collection of objects of Natural History, chiefly fishes.

10. From R. Swinhoe, Esq., of H. M. Consulate, Amoy, a collection of Chinese birds, with an undescribed species of Shrew.

11. From Dr. McGowan, Ningpo, a fine specimen of a flake of *balein*, or so called 'Whale bone,' perfect and unmutilated.

12. From Major W. S. Ferris, 12th N. I. a fine head and casque of *Buciros cavatus*.

13. From the Rev. J. Baker, Jr., Cochin, a valuable collection of Natural History specimens from Southern Malabar.

The following gentlemen duly proposed at the last meeting were ballotted for and elected Ordinary Members.

C. W. Wilmot, Esq., Captain J. E. Gastrell, 13th Regiment, N. I.; I. B. N. Hennessey, Esq., 1st Assistant G. T. Survey of India.

Lieut. W. G. Murray, 68th N. I.; W. Scott, Esq. chief Draftsman S. G. O.; J. Obbard, Esq.; W. T. Blanford, Esq.; Baboo Boloi Chund Sing; Maharajah Narendra Narian Bhupa of Cooch Behar.

The following gentlemen were named for ballot as Ordinary Members at the next meeting.

Dr. A Campbell, Darjeeling, proposed for re-election by Mr. Grote, seconded by Mr. W. S. Atkinson.

Captain J. Sherwill, R. Survey, Dinajpore, proposed by Mr. Grote, seconded by Mr. Atkinson.

Captain H. Hopkinson, Commissioner, Tenasserim Provinces, proposed for re-election by Mr. Atkinson, and seconded by Mr. Grote.

A. E. Russell, Esq., C. S. proposed by Mr. W. Theobald, and seconded by Mr. Medlicott.

W. L. Wilson, Esq., proposed by Mr. W. Theobald, and seconded by Mr. Medlicott.

The Reverend F. F. Mazuchelli, D. D. proposed by Captain W. N. Lees, seconded by the President.

Major Seymour Blane, proposed by Captain W. N. Lees, and seconded by Doctor Thomson.

J. Geoghegan, Esq. C. S. proposed by Captain W. N. Lees, and seconded by Mr. Atkinson.

Doctor E. Goodeve, proposed by Doctor Eatwell, and seconded by Doctor Boycott.

Major Douglas, Assistant Professor of Natural Philosophy and Astronomy, Presidency College, proposed (for re-election) by Capt. W. N. Lees, seconded by Major Thuillier.

R. Jones, Esq., Professor of Moral and Mental Philosophy, Presidency College, proposed (for re-election) by Capt. W. N. Lees and seconded by the President.

David M. Gardner, Esq., C. S., proposed by Dr. Fayrer, seconded by Mr. Atkinson.

#### THE COUNCIL REPORTED.

1. That they had adopted and begged to submit for the adoption of the Society the following report from the Philological Committee, recommending that the publication in the *Bibliotheca Indica* of the Arabic Dictionary of Technical Terms, which it had been agreed to discontinue in consequence of the failure of funds, should now be proceeded with.

#### REPORT OF THE PHILOLOGICAL COMMITTEE.

The publications of the *Bibliotheca Indica* having been resumed, a question has arisen as to the expediency of completing the Arabic works already commenced. The letter of the late Hon'ble Court of Directors expressly gave permission for such completion, but the state of the Oriental Fund prevented the Society from proceeding with them, and it was resolved to leave them to be completed by private enterprise. Of the two works thus unfinished, the "Dictionary of Technical Terms" has naturally the best claim to be continued, as its subject is of more general use than the "Biogra-

phies of persons who knew Mahammed," while at the same time it is much nearer completion.

It appears that of the 1257 pages of the original MS. 717 pages have been already printed, and only 540 remain. The part already printed fills 920 pages in the Bib. Indica, but as this embraces numerous additions by the editing Maulavy, which would be discontinued in the remaining portion, it is calculated that the 540 remaining pages of the MS. would barely occupy more than the same number of printed pages. Captain Lees has undertaken to have the work edited at the cost of Rs. 3 per form of 4 pages, which would amount to say 400 Rs. for the whole. The expence of printing say 7 Fasciculi of 560 pages would be somewhat less than 3000 Rs. Thus the total cost of completing the work would be less than 3,500 Rs., and the publication would probably extend over a year and half.

Under these circumstances the Philological Committee strongly recommend to the Council that the work, should be completed. It is a Book of real value in the eyes of Oriental scholars in Europe as well as in India, and there is no hope, they find, of its being completed in any other way than by the Society's undertaking to do it. At the same time the state of the Oriental Fund amply warrants our incurring the increased expenditure.

The Report was adopted.

The Council reported 2ndly, that Mr. Theobald has been placed on the Committee of Natural History.

Communications were received.

1. From R. H. Davies, Esq., Secretary to the Government of Punjaub, forwarding copy of a letter from Major Becher, Deputy Commissioner, Huzara, at present on special duty at Cashmir, giving the result of his enquiries into the origin of the Indus Flood of August, 1858.

The Secretary remarked that this paper would be published in the forthcoming No. of the Journal, together with Captain Henderson's report, which was read on a former occasion. In the meantime he thought it would be interesting to the meeting, if he stated shortly the results at which Major Becher had arrived.

From Major Becher's report it appeared that the warning letter received at Attock had been traced to two Syuds living at *Kalingar* in Huzara.

Major Becher, confirmed from independent sources by Captain Montgomerie, stated as the result of his enquiries that the recent flood of August, 1858, was caused by the stoppage of the river *Hoonza* about a day's journey above the Fort of that name, and 4 or 5 days northwards of Gilgit. The site of the obstruction would thus appear to be about 300 miles above Attock. "It was caused," Major Becher said, "by the subsidence of a mountain side called *Phungurh* from the action or rain and snow above, and of the stream below, in the winter of 1858."

The obstruction appeared to have continued 6 months before the accumulated waters forced a passage.

Men had been despatched by Major Becher to make personal enquiries, and if possible to see the spot, where the landslip occurred, but letters had been received from them from the borders of Kohistan and Gilgit, declaring that it was impossible to proceed further, in consequence of hostilities between the chief of *Nuggur* and those of *Hoonza* and *Gilgit*.

Major Becher thought there was no foundation for the rumour which was current, that a fresh obstruction had occurred.

Reverting to the flood of 1841, Major Becher shewed that it was occasioned by the damming up of the main stream of the Indus across which the shoulder of a mountain was precipitated by an Earthquake. This mountain was called *Ultoo Kuun*, and was situated about 5 coss south of "*Ghor*," between *Fulzcha* and the Fort of Boonjee, in the district of Astor or Hussoora.

2. From Col. J. Abbott, a few particulars regarding some ancient copper coins presented by him to the Society in June last.

3. From Messrs. Hermann and R. Schlagintweit, Official Reports on the last journey and death of Adolphe Schlagintweit in Turkistan.

4. From the Under-Secretary to the Government of India, forwarding an Itinerary with memoranda chiefly topographical and zoological through the southerly portions of the district of Amherst, Province of Tenasserim, accompanied by a map, by Major S. R. Tickell, together with copious Botanical Notes by the Rev. C. S. P. Parish, Chaplain of Moulmein.

5. From W. Theobald, Esq. Jr., Descriptions of some new



Burmese and Indian Helicidae, with remarks on some previously described species.

6. From Baboo Radahnauth Sikdar, an abstract of the Hourly meteorological observations taken at the Surveyor General's Office in the month of February last.

The Officiating Librarian submitted the usual monthly report.

Mr. J. G. Medlicott read a "Note on the Geological structure of parts of Central India."

Mr. Medlicott first pointed out, with the assistance of Maps, the existence of some remarkable features in the physical aspect of a band of country, which stretching in a generally E. and W. direction, across Central India, includes the valley of the Nerbudda and that of the Soane, from Mundlaisir on the former, to Rhotasgur on the latter. These are, first, the persistently rectilinear direction of two ranges of hills, one on the north of both these vallies, and the other on the south of them, and next, the close approach to parallelism maintained by these ranges throughout a length of between 500 and 600 miles.

It was then shown that each of these parallel lines is a geological boundary, and that each of these boundaries is a fault, lastly, that the movements which caused these faults, occurred with an interval of, at least, one whole geological period, between them.

Briefly analysing a theory held by many geologists, and which affirms the synchronous origin of parallel faults, and describing some of the difficulties attending the satisfactory application to facts, of this theory, Mr. Medlicott concluded by showing, how, and to what extent, the example before the meeting must be considered as furnishing an exception, and as being a case in which the theory does not hold good. Believing that it was desirable to place on record instances of this nature, he at the same time deprecated the idea of hastily discrediting the theory with what may be only an apparent failure, consequent perhaps on the neglect or erroneous appreciation of some conditions having vitiated the result of otherwise careful observations and cautious inductions.

The thanks of the meeting were voted to Mr. Medlicott for his able paper.



JOURNAL  
OF THE  
ASIATIC SOCIETY.

No. IV. 1859.

*Descriptions of some new Burmese and Indian Helicidæ with remarks on some previously described species.—By W. THEOBALD, Junr.*

H. Uter. n. s.

Testâ perforatâ, suborbiculari, carinatâ, tenui, lineis undatis et confluentibus subtilissime impressâ, sub epidermide deciduo evanescentibus, castaneâ, pallidissime rubicundulâ.

Anfract.  $5\frac{1}{2}$  vix rapide, crescentibus; ultimo ad aperturam vix descendente.

Apertura lunari. Perist. recto—

Diam. 1.04. Alt. 0.64.\* Habitat. prope Maulmein.

In general appearance this shell resembles a dextral H. retrorsa, but differs in being more tumid and also in size and sculpture. A single specimen was presented to me by W. S. Atkinson, Esq. who procured it with other known species near Maulmein.

H. Atkinsoni, n. s.

Testâ depressâ, infundibule-forme-umbilicata, lineis transversis rugose striatâ, lineisque spiralibus obscure leviter decussatâ obtuse carinatâ, sordide albidâ (forsan in meliore specimine corneâ) semi-translucente, suturâ impressa. Anfract. 5 convexiusculis, Apertura obliquâ. Perist. leviter incrassato, non reflexo.

Diam. 0.54 Alt. 0.20. Habitat prope Maulmein.

A single dead shell was found near Maulmein by Mr. Atkinson, after whom I have named it.

\* Inches.

*H. Tickelli*, n. s.

Testâ orbiculatâ, depresso-conoideâ, acute carinatâ corneâ, apice polito, supra transverse rugose striatâ, subter glabrâ, semepolitâ—Anfract.  $6\frac{1}{2}$  suturâ impressa, aperturâ coarctatâ. Perist. incrassato albido, dentibus munito, hoc prope umbilicum, illo prope peripheriam duplicato, sive bipapilloso.

Diam. 0.36. Alt. 0.21. Habitat prope Maulmein, non raro.

This shell closely resembles *H. Capessens*, but differs from that shell in the two outer teeth being united to form one double one. I have much pleasure in naming it after the well known Indian ornithologist, whose hospitality I experienced at Maulmein.

*H. Phayrei*, n. s.

Testâ lenticulari, infundibuliforme-umbilicatâ, obtuse carinatâ lineis transversis flexuosis et confluentibus fortiter striatâ, anfract. 6, convexiusculis, sutura impressâ, aperturâ obliquâ, subquadratâ. Perist. tenui, reflexiusculo.

Diam. 0.68. Alt. 0.30. Habitat prope ripas Irawadi regno Birmanico—inter Ava et Prome.

This shell was procured by Mr. Oldham, whilst attached to the late embassy to Ava, and is named after the Envoy whose devotion to Natural History is so well known. It closely resembles *H. Rotatoria*, but has a more elevated spire, coarser sculpture, a narrower umbilicus and is less sharply keeled.

*H. Zoroaster*, n. s.

Testâ umbilicata depresso-globosa, minute striata, cornea ad peripheriam rufro unifasciata; (interdum non cincta, pallide corneâ sive vitrea;) Anfract. 5. Aperturâ parum obliquâ, rotundato lunari, Perist. tenui, reflexiusculo.

Diam. 0.62 Alt. 0.34. Habitat prope ripas Irawadi regno Birmanico, inter Ava et Prome.

This shell unites the characters of *H. Sculpturita*, *H. similis*, and *H. Bolus*. From the few specimens I have it is not quite clear if the banded and bandless shells do not represent distinct species, the bandless shells being rather larger than the rest.

*H. Akowtongensis*, n. s.

Testâ lenticulari, depressa acute carinatâ infundibuliforme umbilicatâ transverse striatâ fuesco-corneâ Anfract.  $5\frac{1}{2}$  Perist. tenui, reflexiusculo.

Diam. 0.58. Alt. 0.25. Habitat ad Akowtong Provincia Pegu, prope ripas Irawadi.

A single dead shell, occurred with numbers of *H. rotatoria*, which it generally resembles, but from which it is distinguished by its sharper keel, more depressed spire, and simpler sculpture.

*H. Poongee*, n. s.

Testâ turbinate conoideâ, tenui, apice depressiusculo, anguste umbilicatâ, tumida, fusco-corneâ, Anfract.  $6\frac{1}{2}$  convexis. Apertura rotunde lunari. Perist. recto, acuto.

Diam. 0.26. Alt. 0.20. Habitat prope Maulmein.

A thin brown helix, somewhat resembling the small *H. molecula* but with a more elevated spire, which, however, varies a little in different specimens.

In addition to these, two new helices of a peculiar type and a new *Sheptaxis* (*S. Sankeyi*. B.) have been received by Mr. Benson from near Maulmein, descriptions of which may soon be looked for. The shells forwarded to me by Capt. Haughton have enabled me to rectify an error in Mr. Benson's description of a somewhat singular origin, viz. that *Megalomastoma gravidum* is merely the adult shell of *Otopoma Blennus*, which should now stand as *Otopoma Gravidum*. The only live specimen of *O. gravidum* procured by me at Maulmein, was furnished with a thin operculum, without doubt being abnormally formed after the loss of the original shelly one. This operculum was, I believe, sent to Mr. Benson and hence the mistake in question. The true operculum of *O. Gravidum* is the same as that described by Mr. Benson as appertaining to *O. Blennus*.

There appear to be two species of *Streptaxis* at Maulmein besides the new one just received by Mr. Benson. The shell which I take for *S. Petiti* is very variable in size and other particulars, which may account for some discrepancy in the description and my specimens. In the largest shells the description holds—"anfract. penultimus subangulatus," but in the smaller shells the keel is well pronounced. The extremes of this species (?) are Diam. max. 0.54 in the largest specimen and 0.39 in the smallest. The aperture too is more rounded than in the next species, in which it is very square.

The other species which I cannot identify is tolerably uniform in size being about 0.47 in extreme length. The penultimate whorl

is very sharply keeled and the spire much flatter than in the first species, and I may here remark that I cannot get over the impression that *H. Bombax* is nothing more than the young of the rounder of these two species of *Streptaxis*. (*S. Petiti*?) I regret not having paid attention to the respective distribution of these species, which I had previously confounded together. Together with the above shells I received a single specimen of *Bulimus citrinus* (var?) which I had not myself noticed so far North. It measures only 1.01.

In the May number of the *Annals of Natural History* for the present year Mr. Benson expresses his unhesitating conviction that my *H. Castor* is nothing more than the young of his *H. Oxytes*. I can only account for this by supposing that the specimen forwarded by me was smashed in transit and that Mr. Benson relies on some other source for his information. If a writer were unused to attach any weight to "*habitat*" and "*distribution*" in the discrimination of nearly affined species, he would have some reason perhaps to regard *H. Castor* as an extreme variety of *H. inversicolor*, wanting it is true the solidity, pronounced sculpture, colour and the closed umbilicus of that species, but not *absolutely* differing in any one character of importance, it is therefore out of the question associating it with the widely umbilicated *H. Oxytes*.

*H. Pollux* is of a similar type with *H. Castor*, and therefore cannot be allied to *H. Chevalieri*—which has, "*umbilicus latus*" or to any similar shell.

Mr. Benson also alludes to a shell which Mr. W. Blanford considered to be a young variety of *H. Cyclophlax*, but a shell which I received from Mr. W. Blanford, as such, is unquestionably distinct, though it is most probable that Mr. Blanford only sent home specimens of *H. Cyclophlax*, as otherwise Mr. Benson would hardly have failed I think to recognise a new species in the shell I shall now describe.

*Helix Blanfordi*, n. s.

Testâ umbilicatâ, depressâ, late, sive costulate striatâ, exilissime et minutissime flexuose granulatâ, ad peripheriam undatâ—ferrugineo-corneâ, acute carinatâ, lineâ peripheriali tenui albidâ cinctâ, ad suturam anfractus ultimi notandâ—Anfract.  $5\frac{1}{2}$ , ultimo circa umbilicum vix perspectivum tumido. Apertura angulate lunari. Perist. acuto ad umbilicum parum dilato, crassiusculo.

Habitat prope Darjiling. Diam. 0.96. Alt. 0.35.

A young specimen of *H. Cyclophlax* measuring Diam. 0.96. At. 0.45.

The character on which I chiefly rely in separating the above shell from *H. Cyclophlax* is the almost microscopic sculpture it presents, so different from its allies *H. Cyclophlax* and *H. Oxytes*. These two last are indeed far more closely allied than either to the one above described. In size, colour, form and sculpture they do not differ more than is observable in local varieties of one species, the sole material point of difference seeming to me to consist in the flattening down of the mouth of *H. Cyclophlax*, which is not observable in *H. Oxytes*. The wide set striation of *H. Blanfordi* develops towards the periphery a slightly undulating outline calling to mind, though on a small scale, the somewhat similar feature in *H. Bainbridgei*.

*Succinea Girnarica*, n. s.

(*S. prodigium* *Mss. olim.*)

Testâ oblonge-ovatâ solidâ non politâ, tumida, fortiter striata rubro-flavescente magis minusve rutilo, aliquando pallescente; Anfract.  $2\frac{1}{2}$  rapidissime crescentibus, ultimo capacissimo. Aperturâ rotundatâ. Perist. tenui. Diam. 1.07, 0.61. Alt. 0.42.

Habitat in cacuminibus et locis elevationibus montis Girnar Peninsula Gujeratensi, dicta Katiwar.

Few specimens attain the dimensions here given. The largest shells are found on the peaks of the Eastern portion of the Girnar Hills and at a lower elevation of about 2000 feet, the shells are much smaller and paler coloured. They congregate in large numbers together in the crevices of the rocks to which they adhere so firmly, that it is no easy matter to dislodge them from their retreat. On the central peaks they are accompanied by the curious little *Camptonyx Theobaldi* B. though I did not observe that shell on the outer hills.

*Calcutta, July 1st, 1859.*

*On the influence of Mountain-Attraction on the determination of the relative heights of Mount Everest, near Darjeeling, and the lofty peak lately discovered near Kashmir.*

*Read at the Monthly Meeting of the Asiatic Society, Sept. 1859.*

In the communication read at the July meeting of the Asiatic Society by Major Thuillier, the interesting fact was stated that a mountain has been found in the neighbourhood of Kashmir (about  $36^{\circ}$  North latitude and  $76\frac{3}{4}^{\circ}$  East longitude), of which the height does not fall far short of Mount Everest (Lat.  $28^{\circ}$ , Long.  $87^{\circ}$ ), the highest known mountain in the world, and which towers up to 29,002 feet or  $5\frac{1}{2}$  miles above the level of the sea. The newly discovered peak is only 724 feet lower than this, and is 122 feet higher than Kunchinjunga, the highest known before the discovery of Mount Everest. And hopes are held out that before the survey of the hills in the neighbourhood is completed, some other mountain may yet be found in that western extremity of the range to rear its head as high even as the monarch of the east.

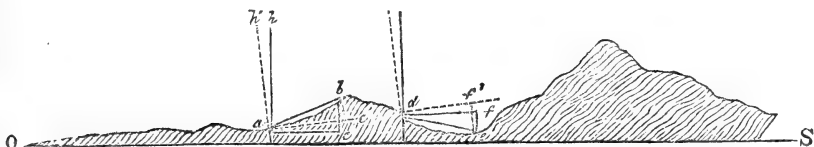
2. In the coming contest, then, for the sovereignty between the East and West of this stupendous range of mountains even a *small* circumstance may give the palm to one or the other. It is with this feeling that I lay the following statement before the Society.

In itself the precise determination of the height of a mountain is a matter of little importance. It is not to be compared, in a scientific point of view, with the importance of obtaining correct *horizontal* measures and the correct curvature of the arcs measured. But where mountains are contending for the pre-eminence of being the highest in the whole world, the question assumes special interest.

3. I take it for granted, that, as the effect of Mountain-Attraction on the levelling of the instruments of observation has not been taken account of in the Survey of the Plains, the same course has been followed in the Survey of the Mountains. It is to the effect which this disturbing cause must have upon the measurement of the heights in question, that I wish to call attention. My results will be only approximations: but I believe they are sufficient to show the tendency of things, and to add one more illustration to



others, I have elsewhere given, of the importance of means being taken to calculate the effects of this disturbing cause more completely.



4. The diagram above is an ideal vertical section of the plains and mountains, intended merely to illustrate the effect of Mountain-Attraction upon the determination of the heights.

OS is the sea-level, (lying on that spheroidal surface, of ellipticity  $\frac{1}{300}$ , of which the Ocean is supposed to form a part). To this level all heights are referred in the Survey:  $a$  and  $b$  are two stations of observation,  $ah$  the vertical at  $a$  perpendicular to the sea-level: the height of  $b$  above  $a$  is determined by the Survey, and this being done at each succeeding station the height of the highest peak is found by adding together the successive changes in height. In this diagram I have supposed all the stations of observation, leading from the sea up to the highest peak, to lie in the same vertical plane. This is not the case, some will lie on one side and some on the other. But taking this into account would make no difference in my results.

Draw  $ac$  parallel to the sea-level and  $bc$  perpendicular to it. Then  $bc$  is the true height of  $b$  above  $a$ . But the plumb-line will not hang in the line  $ha$ , but in another line  $h'a$ , owing to the Attraction of the Mountains: and therefore the spirit-level will make  $ac'$  (at right angles to  $ah'$ ) the apparent level line at  $a$ , and not  $ac$ . Hence, if  $bc'$  be at right angles to  $ac'$ ,  $bc'$  is the height of  $b$  above  $a$ , as brought out by the Survey. This is too small by  $bc - bc'$ .

Let the angle  $h'ah = v$ , and angle  $bac = \theta$ . Then

$$\begin{aligned} bc - bc' &= ab \sin \theta - ab \sin (\theta - v) \\ &= ab \sin \theta - ab \sin \theta \cos v + ab \cos \theta \sin v \\ &= ab \cos \theta \text{ arc } v'', \text{ because } v \text{ is very small} \\ &= ac \times \text{arc } v'' \end{aligned}$$

Hence Mountain-attraction, if not corrected in the calculation, will have the effect of making  $b$  less high above  $a$  than it really is, by a space  $= ac \times \text{arc } v''$ .

5. The same will be the case where the next station (as  $e$ ) is lower, instead of higher, than the station from which the observation is made (as  $d$ ). The Survey makes the distance of  $e$  below  $d = ef'$ , whereas it really is  $ef$ . Hence the effect of Mountain-Attraction is, as before, to make the successive heights above the sea-level too small.

6. I will now endeavour to approximate to the aggregate effect of this disturbing cause upon the heights of Mount Everest in the East and of the newly discovered Mountain in the West.

In communications to the Royal Society (see *Phil. Trans.* 1855 and 1859) I have shown that if through a point in the meridian of Cape Comorin and in latitude  $33^\circ$  a straight line be drawn in a direction E. S. E., that line may be regarded as an Axis of the Himalayas; such that the Mountain-Mass attracts places in the plains with a force varying inversely as the distance from that axis, at any rate for stations lying between the foot of the hills and a distance of about 1000 miles from the axis.

Also it is shown that at a distance of 222 miles from this axis the deflection of the plumb-line towards the north is  $28''$ , and therefore in a direction at right angles to the axis  $= 28'' \sec. 22^\circ 30' = 30''$ . A line about parallel with the axis at a distance of 156 miles marks the average commencement of the plains. From this line, then, the law of the inverse distance according to which the deflections vary, may be supposed to begin. Within this limit, that is, within the hill-region, the law will be different. At the line itself, that is, at the foot of the hills, the deflection northwards will be  $=$

$$\frac{222}{156} 28'' = 40'', \text{ and the deflection towards the axis } = \frac{222}{156} 30'' = 43''.$$

7. Assuming that these data hold good for the foot of the hills below Darjeeling and for those below Kashmir, I proceed to find the accumulated effect of the errors in height at a series of stations, connecting the nearest point of the sea, viz. the Sandheads due South, with the foot of the Darjeeling Hills, running over a space of about 360 miles: and then the same at a series of stations, con-

necting the nearest point of the sea, viz. the mouths of the Indus, with the foot of the Kashmir Hills, running over a space of about 720 miles.

8. In the case, then, of Mount Everest in the Darjeeling Hills, the line of stations runs up due north over 360 miles to the foot of the hills, from which the distance due north to the axis =  $156 \times \sec. 22^{\circ} 30' = 168$  miles. Suppose the stations along this line are at 12 miles distance from each other in succession (which is about the average used in the Survey). There will be 30 such stations, at the distances 180, 192, ..... 516 miles from the axis of the Himmalayas, measured due north. Hence at these places the deflections of the plumb-line (which vary inversely as the distance from the axis) are

$$\frac{168}{180} 40'', \frac{168}{192} 40'', \dots\dots\dots \frac{168}{516} 40''.$$

Now by para. 4 the difference of level caused by a deflection  $40'' = 12 \text{ miles} \times \text{arc } 40''$ .

$$= 12 \times 3 \times 1760 \times \frac{40}{180 \times 60 \times 60} \pi = 12.3 \text{ feet.}$$

Hence, the aggregate change of level between the foot of the Darjeeling Hills, arising from this cause,

$$\begin{aligned} &= 12.3 \left\{ \frac{14}{15} + \frac{14}{16} + \dots\dots\dots + \frac{14}{43} \right\} \text{ feet.} \\ &= 172.2 \left\{ \frac{1}{15} + \frac{1}{16} + \dots\dots\dots + \frac{1}{43} \right\} \\ &= 172.2 \times 1.098 = 189 \text{ feet.} \end{aligned}$$

9. I will now find the change of level at the other extremity of the range. The range there slightly inclines more to the north. The axis of the Himmalayas may therefore be taken, for those parts, to be a line drawn, as before, though a point in latitude  $33^{\circ}$  of the meridian of Cape Comorin, but inclined  $30^{\circ}$  north of west. This axis runs near Skardo; and is, as before, about 156 miles from the foot of the hills; which are about 720 miles from the mouths

of the Indus, the nearest point of the sea. The line joining the sea with the foot of the hills passes over 720 miles (or 60 stations at 12 miles apart) and is about perpendicular to the axis above described, which is 156 miles beyond the foot of the hills.

Pursuing the same course as before, I find that the aggregate change of level of the foot of the Kashmir Hills above the sea level, owing to Mountain-Attraction not being taken into consideration,

$$\begin{aligned}
 &= 12.3 \times \frac{43''}{40''} \left\{ \frac{156}{168} + \frac{156}{180} + \dots + \frac{156}{876} \right\} \\
 &= 12.3 \times \frac{43}{40} \times 13 \left\{ \frac{1}{14} + \frac{1}{15} + \dots + \frac{1}{73} \right\}^* \\
 &= 171.9 \times 1.694 = 291.2 \text{ feet.}
 \end{aligned}$$

These calculations, then, if correct, show that the plains at the foot of the Darjeeling Hills are higher above the sea-level than the Survey makes them by 189 feet: and that the plains at the foot of the Kashmir Hills are higher above the sea-level than the Survey makes them by 291 feet. This gives 102 feet in favour of the plains near Kashmir above those near Darjeeling, arising from this cause.

10. I have yet to take into account the effect of Mountain-Attraction on the change of level along the line of stations connecting the plains with the mountains of which the altitude is under consideration. The law of deflection begins to alter from that of the inverse distance as soon as we enter the mass itself—just, as is well known, in the case of a sphere; a point outside it is attracted with a force varying inversely as the square of the distance from its centre, and therefore increasing as the point approaches: but as soon as the point enters the sphere it is attracted with a force varying directly as the distance from the centre, and therefore diminishing: the attraction at the surface of the sphere is greater than on any point outside or inside.

\* I may observe that I have summed this and the previous harmonic series by using a table of cosines and secants, and adding up the cosines of the angles of which the secants are 14, 15, 16, &c.

So with the Himmalayan Mass. Its attraction on points outside the mass is shown (within certain limits) to be inversely as the distance from a given fixed line. But when we take a station within the mountain region this law must cease, and some other one come into operation. I have not the means of ascertaining what that law is. But, whatever it may be, it seems probable that it will be much the same as we pass in among the Kashmir Mountains, as it is in passing in among the Darjeeling Mountains. But the distance of the newly-discovered Mountain near Kashmir is about 270 miles from the foot of the hills, whereas Mount Everest is only about 100 miles. This circumstance must of itself give a great advantage to the Kashmir heights over those of the east end of the range.

11. In the above calculations I have considered the effect of the attraction of the Mountain Mass lying on the north of India. It is possible, that other causes may exist which either increase or moderate this effect. When any such cause is found its influence should be ascertained. One cause, besides the attraction of the north, lies in the deficiency of matter in the vast ocean lying on the south of India. This operates in two ways: (1) by affecting the plumb-line and producing effects similar to those I have been considering: and (2) by changing the sea-level at the Sandheads and also at the mouths of the Indus, that is, at the commencement of each of the two series of stations I have supposed to connect the sea with the Mountains in question. In this latter effect also the mountains give their aid.

The first of these causes will, as in the case of Mountain-attraction, make the height of Kashmir greater than the Survey makes it relatively to the east end of the range; while the effect of the second is doubtful. I have shown in a Paper read in December last before the Royal Society (see Proceedings, No. 34, p. 599), that the sea-level at the mouths of the Indus is very probably about 500 feet higher than at Cape Comorin owing to this cause. But how much higher it is at the Sandheads than at Cape Comorin, I did not in that calculation determine, as it was not required for the purposes of the paper. I should imagine that it would be very much the same as at the mouths of the Indus, as the Sandheads

are situated with reference to neighbouring seas and the vast ocean very similarly to them.

12. In conclusion, my own persuasion is, that when sufficient data are obtained to make the calculation complete, it will be found that Mountain-attraction, combined with deficiency of attraction of the Ocean, so far affects the levelling of the instruments of observation, as to cause the Survey to bring out the height of the newly-discovered Mountain near Kashmir too low by 150 or 200 feet relatively to Mount Everest. And consequently, that if a peak be found in those western Mountains, of which the height is about 200 feet less than that of Mount Everest according to the Survey measures, I believe myself, that there will be good ground at least for hesitating before we pronounce finally which of them is really the king of the whole range.

J. H. PRATT.

*Calcutta, July 21st, 1859.*

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*Notes on Káfiristán.*—By Captain H. G. RAVERY, 3rd Regt.  
Bombay, N. I.

*Prefatory Remarks.*

Forty years have elapsed, since the Hon'ble Mountstuart Elphinstone, on returning from his embassy at the court of Shah Shújah-ul-Mulk, king of Afghánistán, in his valuable work on "Caubul," gave a description of that highly interesting and brave race of people, the Sí'áh-posh Káfirs, supposed to be descendants of the Bákhtrian Greeks.

Some twenty years subsequent to Mr. Elphinstone, Sir Alexander Burnes, in the account of his journey into Central Asia, gave a slight notice of this people, the meagreness of which drew forth the animadversions of the Edinburgh Reviewer, who, in the number for January 1835, thus notices the subject:—

"The remarks which our author makes on the Siah-posh Káfirs, or black-clad unbelievers, who inhabit the high mountains, which divide the basins of the Kábul and Badakshan rivers, are in like manner infelicitous as well as scanty. He tells us that he can add nothing to the intelligence respecting them collected by Mr. Elphinstone. Yet, imbibing the prejudices of his Mahomedan informants, he calls the Káfirs savages; which is certainly representing them under a new aspect; and this variance is the more remarkable, since Mr. Burnes, while at Peshawer, formed an acquaintance with Moolah Najeeb, a respectable man, who had travelled into the Kafir country at the instigation of Mr. Elphinstone, and who gave, on his return, a very interesting and favourable account of these brave and ingenuous mountaineers. 'The Káfirs,' says our author, 'live in a most barbarous manner, eating bears and monkeys;' a kind of food which does not appear to us to afford any incontrovertible implication of barbarism. The mention of monkeys suggests a well wooded country. We know that the black-coated unbelievers have wine in abundance, which they boil; and always carry a small vessel filled with it, suspended from their necks. The missionary Goetz heard with pleasure of a fair complexioned, wine-drinking race of mountaineers, who were not Mahomedans; and hesitated not to conclude

that they were Christians ; and he alludes to their name of Siah-posh, when he gravely informs us, that they always go to church dressed in black. The language of these people, of which our author has collected a few words, belongs evidently to the Indian family. They are probably the fountain whence large streams of population have poured on the country below.\* The local situation of this aboriginal tribe, and the independence they have so obstinately maintained, tend alike to increase our interest in them, and our wish that their secluded valleys, overhung with vineyards, were explored by some intelligent European traveller."

Sir Alexander Burnes in his work entitled, "Kabul, in 1836, '37 and '38," has given a somewhat longer account of this people ; yet, considering the excellent opportunities he must have had, it is far short of what might have been expected. At page 207 he says, "The account given by Mr. Elphinstone renders it unnecessary to repeat many of the details which I have received and which corroborate his statements."

It appears rather surprising, that, during a residence of nearly three years at Kábul, within four or five days journey of the Káfir frontier—and on one occasion when still nearer, on visiting the Koh-i-Dáman and Kohistán ; and when he despatched Messrs. Lord and Leech to explore the passes of Hindú Kush,—he did not send some officer into Káfiristán. He entered Kábul from India on the 20th September, 1836 ; and it was only on the 15th November, 1837, after fourteen months had passed away, that Messrs. Wood and Lord were sent to Kundúz and Badakhshán.

Situated as he was at the time I speak of, with several intelligent officers at his disposal ; and not knowing how soon he might have to leave Afghánistán, or how quickly the British Indian Government might have to come into hostile contact with the Afgháns and other tribes inhabiting the countries in the vicinity of Kábul, every effort should have been made to gain all possible information concerning them, without awakening the suspicion of Dost Muhammad and his Amírs, by over eagerness. He should have deputed one of the officers associated with him, into the Káfir country, at that time a matter of no danger.

\* They are the aboriginals of the country below probably ; but the Afgháns came from the far west, and are a wholly different race.



In a note at page 207 of the work to which I have before alluded, Sir Alexander Burnes remarks that, "Since the British entered Afghánistán, one of the Káfirs near Jellalabad, sent a congratulatory message at the arrival of so many Káfir brethren as ourselves." Here again a grand opportunity offered for sending an intelligent officer into Káfiristán, or at least that part of it under the authority of this Káfir chief. With what contempt, and John Bullish phlegm, and Indian listlessness, this party of friendly Káfirs was treated, will be found related below from the information of an eye-witness.

During a residence at Pes'háwer in 1849 and '50, I naturally, felt great curiosity respecting these interesting tribes, who, centuries ago, had resisted the hordes of Tímúr-i-Lang; baffled the legions of Akbar; and although surrounded on all sides by the fanatic, warlike, and ambitious enemies of their faith, have, up to the present day, preserved their independence, and even exact tribute from some of them; I was induced to send an intelligent man, a native of Kandahár, into the Káfir country to gain whatever information he could respecting this people, their country, and their manners and customs.

After an absence of nearly two years, by which time, I had given him up as lost,—the man and the money also which I had entrusted to him for his expenses,—he returned with an account of the Káfir-country and people, as also of Káshkár or Chitrál, Panjkorah, and other little known localities of Hindú Kush.

A Moulvi of Hasht-nagar, in the Pes'háwer district, whom I met with at Poonah, resided for several years at Dír, the chief town of Panjkorah, and close to the Káfir and Káshkár frontiers. He has supplied me with much of his own personal observation, which, together with other information gathered whilst at Pes'háwer, from various persons who had visited Káfiristán and the other petty states noticed in this paper, has enabled me to compare and check the different statements, the whole of which I have found generally to agree on all essential points, and to contain matter of some interest, though more meagre than I could have wished.

I had kept this paper by me, in the hope of returning to Pes'háwer, and of then adding to the information contained in it, or even

to have subjoined my own personal observations; for I had long cherished the idea of entering the Káfir country; and I would have effected it too, had I not been, during a number of years employment in the Panjáb, constantly kept at a distance from Pes'hawer—the chief city of our possessions in the Afghán country—which from my knowledge of the Pushto or Afghán language would have been my proper place.

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The country lying between the 34th and 37th degrees of north latitude, and the parallels of 69° 30' and 74° 30' of east longitude, embracing the culminating ridges and slopes of the Hindú Kush—the Paropamisus and Indian Caucasus of the ancients—is, at the present day, divided into a number of petty independent states, inhabited by several highly interesting tribes, concerning whom our information is more scanty and imperfect than could be wished, and whom modern travellers have but briefly noticed.

These districts and valleys of the Kábul river and its tributary streams, have, from their rugged nature and strong situation, a natural tendency to resolve themselves into petty states, which have long been independent; and which, under their own chiefs, still continue to maintain their freedom. They are known at present under the names of Káfiristán, Chitrál, or Chitrár, or Káshkár, as it is variously termed, Panjkorah, Gilgitt, Suwát, Buner, Bájáwer, Kuner or Kámah, and Lamghán, all lying to the north of, and between the Kábul river (Kophenes) and the Sindhu or Indus. They require to be noticed in detail.

#### KÁFIRISTÁN.

The tract of country inhabited by that highly interesting race of people, known by the name of Sí'áh-posh Káfirs, or "Black-clad unbelievers," is designated Káfiristán—a compound word derived from the Arabic كافر (*ká-fir*) an infidel or unbeliever, and the Persian participle ستان (*istán*) a place, a station. It is bounded on the north by the Uzbek states of Kundúz, and Badakhshán; south by the cantons or districts of Lamghán or Laghmán and Kámah, situated on the northern bank of the Kábul river; east by Chitrál

or Káshkár, Panjkorah, and Bájáwer; and west by the mountains on the left bank of the Panjsher river, the eastern boundary of the valley of that name, the Koh-dáman, and the Kohistán or Highlands of Kábul. Within its boundaries are included the ridges and steep spurs of the Hindú Kush, enclosing narrow and fertile valleys descending in terraces towards the Kábul river and the Indus, in a north-east and south-west direction.

The valleys are watered by numerous streams somewhat like the ramifications and reticulations of a leaf, which running east and west, at length fall into the five considerable rivers intersecting the country. These take their rise on the southern slopes of the Hindú Kush, and flow towards the south until they empty themselves into the river of Kábul, the Kophenes of the Greeks, which running east, disembogues into the *Aba-sind* or "Father of Rivers"—as the Indus or Attak\* is termed in the Afghán language—a little above the town bearing the latter name.

Other less important streams, rising in the northern slope of the mountains, run towards the north, until they fall into the Oxus and its tributaries.

The largest of the five principal rivers above alluded to, the most easterly, and separating the upper part of Káfiristán from Chitrál or Káshkár, rises on the southern slope of the Belút Tágh or Cloudy Mountains (in the Túrki language); but known by the Afgháns, and other tribes inhabiting these regions, by the Persian name of Belúristán or the "Region of Crystal"† from the quantities of that substance found there, at the *Táláb-i-níl*, or "Blue Lake,"‡ lying further to the south than that of Sir-i-kol§ visited by Wood,

\* *اټک* *Attak*, in Hindí signifies "a bar, obstruction, or obstacle;" and, as may be implied from its meaning, is a name given to the Indus, the river which Hindús, by their religion, are forbidden to cross.

† See KHUSHHÁL KHÁN'S poem in the account of Suwát.

‡ See notice of KÁSHKÁR; and MOORCROFT'S TRAVELS.

§ "An individual who had seen the region between Wakhan and Kashmir informed me that the Kunir river had its principal source in a lake resembling that in which the Oxus has its rise; and that the whole of this country, comprehending the districts of Gilgitt, Gunjit and Chitrál, is a series of mountain defiles that act as water-courses to drain Pámir." 'JOURNEY TO THE OXUS.'

which is considered by him to be the source of the Oxus. After pursuing a south-westerly course, through Káfiristán, Chitrál, Lamghán, and the Kuner or Kámah district, for about three hundred and eighty miles, it joins the Kábul river ten miles below Jelálábád, in Lat. 34° 24' and Long. 70° 35'.

At the junction with the latter stream, and for about thirty miles further up, it is known as the Kámah river, from the name of the district which it waters, situated immediately to the north and east of Jelálábád. Some distance further up, the stream is called the Kuner, from the small town and district on its eastern bank; and a short distance still more to the north, it is at times designated the Núrgil, from the valley and district so called, lying on its western bank, and from which, as well as from districts still further to the north, several smaller tributaries fall into it. As we advance towards its source, it is known as the Chegán-sará'e, from the town of that name on its western bank. Here it receives a minor stream called the Pích, from the north-east, which rising in the Hindú Kush, flows through a valley bearing the same name. By proceeding along its banks Badakhshán may be reached; but the road is difficult and lies through the defiles of the mountains. From Cheghán-sará'e to its source in Belút Tágh or Belúristán, to the north-east, it is known as the river of Káshkár or Chitrál.\*

On the melting of the snows in the spring and summer months, it can only be crossed by means of rafts, formed by tying together the inflated skins of beasts and laying straw on the top of them; for it then becomes much swollen, and increases very considerably in volume, and rolls along over its rocky bed with great impetuosity. From this it is evident, that it must have more than one considerable influx in its upward course. During the winter months, the stream, although still rapid, is of no great volume. It is the Choes of Arrian and the Choaspes of Strabo.

The next river in succession towards the west is the Kow, which also rises on the southern slope of the Hindú Kush, but much lower down towards the south. After a course of about seventy miles,

\* All these names have confused some authors, and have caused them to make several rivers of it. Elphinstone and Moorcroft call it by the general name of Kamch or Kama.

it joins the Shúnah, (erroneously styled the Alingár by some travellers) at Tírgarí in the district of Lamghán, where it receives the Najíl or Alisháng river, and then takes the name of Alingár. After flowing for eight or ten miles further, through the above-named district, it joins the Kábul river some miles west of Jelálábád, at Kergah, a mile to the east of Manderáwer, and about twenty-five miles from the embouchure of the Kámah.

The next river to the west is the Najíl or Alisháng. It likewise takes its rise on the southern slope of the Indian Caucasus, but somewhat further to the south than the preceding, in the district of Najíl, situated to the north of the *darah* or valley of Míl;\* and after running for about sixty miles through the Síáh-posh Káfir country, almost parallel with, and but a few miles distant from the Kow, joins the latter river, after which the united stream is known as the Alingár, as before mentioned.

West of the Alingár is the river of Tagáb or Tagáo, which also taking its rise in the Hindú Kush, flows almost due south for about ninety miles through Káfristán. A few miles from its mouth, after receiving the united streams of Ghorband, Nijrow, Panjsher, and their tributaries, watering the valleys bearing those names, and included in the Kohistán of Kábul, it falls into the river of Kábul about forty miles east of that city.

Numerous small streams, running east and west, and west and east, fall into the whole of these rivers and greatly increase their volume. In fact, every valley, with scarcely an exception, has a rivulet flowing through it, on each side of which is deposited the rich alluvion washed from the mountains by the heavy rains of the winter and spring months, that constitutes the chief and most fertile portion of the land, being well adapted to, and most easily brought under, cultivation. This explanation is applicable to nearly all the alpine districts of the Hindú Kush, and which, though well-watered, contain, comparatively, but little level land capable of tillage. The rivers flow over rocky beds, are rapid, and generally clear; and the five larger ones, when swollen from the melting of the snows in the summer months, increase considerably in rapidity and violence—in

\* Báber mentions that, "the part of Káfristán nearest to Alishang is called *Miel*, and the river of Alishang comes down from *Miel*." MEMOIRS, p. 112.

many places falling over precipices and forming cascades—and attain a breadth of from one hundred to one hundred and fifty yards.

Another considerable river rises in the northern part of Káfiristán on the northern slope of the Hindú Kush, at a place designated by the S'áh-posh, *Kandah-i-níl*—*kandah* in Persian signifying, a dam or dyke.

It flows in a direction almost due north, to fifteen or twenty miles beyond Jerm in Badakhshán; after which, being joined by the Wardoj river (according to Wood), it runs nearly due west, and unites with the Panj or upper branch of the Oxus, whose source is lake Sir-i-kol in Pámir, 15,600 feet above the level of the sea, the highest table-land in Asia, and probably in the world. These united streams (according to the author just quoted) fall into the Oxus at Killæ Cháp. He also calls the first mentioned river by the name of Kokcha; but the Káfirs, in whose country it rises, and the people towards Jerm, consider it the source of the Æmán or Oxus.\* In fact they know it by no other name, and what Lieut. Wood calls the main branch of that river, they designate the Panj.

Besides the large valleys watered by the river rising at *Kandah-i-Níl*, there are several others that open into them and wind amongst the hills in an oblique direction towards Káfiristán. The whole of them send down numerous small streams to the larger rivers. Along the banks of these the Káfirs occasionally make in-roads into Badakhshán.†

\* “Aparená or the west, is the Litodá lake from which issues the Apará-Gan'dicá or Western Gan'dicá, called also Chacshu in the Puránás, Oxus by the Greeks, and Cocshu by the natives. This lake which is the source of the Oxus, is noticed in some maps: by the natives it is called *cul* (kol) or the lake; and by Persian authors Divsarán; Deva-sara in Sanskrit, signifies the lake of the gods, or the divine lake. According to them it is near the mountains of Andemas from the Sanskrit And'ha Tamasa, both words implying darkness, (in the Túrki language Belút Tágh, previously referred to), but being joined together, they imply it in a superlative degree; and it is the name of one of the divisions of hell. On the summit is the *Belur*, or dark country of the maps. WILFORD ON THE SACRED ISLES OF THE WEST. ASIATIC RESEARCHES; Vol. VIII. Pp. 330.”

† “*Robat*, a deserted village seven miles down the valley. It stands at the mouth of a little stream on the right bank of the Kokcha, by the valley of which

The Wardoj, which disembogues into the Kokcha, as already mentioned, rises on the northern slope of the mountains towards Káshkár or Chitrál, through the valley of which, a winding pass, occupying a journey of three days, brings one to the borders of that state, and another pass to the west leads into Káfiristán; but these routes are only practicable in the summer months. Another small stream joins the Panj at Ishtarak in Badakhshán; and by following up the course for three days, the borders of Káshkár are reached.

The regions in which these rivers rise, and through which those south of the Hindú Kush flow, have, from the days of Herodotus downwards, been said to abound in gold, a statement that is fully substantiated: for in the present day, quantities of the precious metal continue to be found in the beds of the rivers. I shall offer some further remarks on this subject in another place.

The physical aspect of Káfiristán is similar to that of the districts further east; and consists of a succession of large and narrow valleys, through which the principal rivers flow, bounded by ridges of lofty mountains on each side, which are generally covered with snow. The large valleys are again crossed in a transverse direction by numerous smaller ones opening into them. These are, in the same manner, again crossed by others still smaller and almost innumerable; and through the whole of these, small streams run and increase the volume of the larger rivers.

There is much diversity of temperature and variability of climate, caused by the occasional great difference of elevation—some parts of the country being considerably depressed. In the more elevated tracts, the summer heat is never oppressive, and in the winter months the snow lies on the ground for many weeks together. The more depressed valleys again are well-sheltered from the cutting blasts of winter; and, although surrounded on all sides by beetling mountains capped with eternal snows, the heat in the months of June, July, and August, is considerable. In some of the most secluded places, it is rather oppressive; and is sufficient to bring to perfection great quantities of excellent grapes, and other fruits, constituting a large portion of the people's food. From the grapes a good the Káfirs usually make their inroad into Badakhshán." "WOOD: JOURNEY TO THE OXUS."

deal of excellent wine is made, for which indeed the Káfirs and their country are somewhat notorious in this part of Asia.

The soil of the valleys is, generally, a rich dark-red mould, containing a large portion of clay, mixed with sand and stones towards the skirt of the hills; whilst that of the narrow and terrace-like strips of land at the sides of the mountains is mixed with sand in a greater proportion.

Rain falls in copious showers, but never for any lengthened period. It occurs chiefly during the spring months, and towards the end of August and September; although occasional showers fall, as in other temperate climates, throughout the year. In the winter violent snow storms are of frequent occurrence, which block up the passes between the hills, and cut off all communication between the different valleys, often for weeks together.

The climate, on the whole, is exceedingly healthy; and but little sickness is known. The principal diseases the people are subject to, appear to be, as in all alpine countries, ophthalmia and fevers. That scourge of the human race, the small-pox, has never yet made its appearance among them, which may be attributed, in great measure, to their slight intercourse with foreigners.

The roads or footpaths are narrow and difficult in the extreme, and every here and there intersected by frightful ravines, yawning chasms, and foaming torrents. These, the Káfirs cross by means of rope bridges—now leading along the brink of tremendous precipices and frowning cliffs—now winding through deep and narrow hollows, dark almost at mid-day. Travellers also incur not a little danger from fragments of rock and stones, that—either loosened by the rain or wind, or disturbed by wild animals and the numerous flocks of goats that crop the herbage on the higher hills and beetling crags, at the base of which they tread their way—every now and then come rolling down with a fearful crash reverberated on all sides.

If the road should be a frequented one, these primitive bridges are made by connecting together four or five stout and strong ropes, made of goats'-hair, by slighter ones at about six or eight inches distance from each other, laid transversely just like the shrouds of a ship's masts with the ratlines across. These are fastened to the trunks of trees on either side, and stretched as tight as possible.



Should there be no trees sufficiently near the spot, the ropes are either attached to strong stakes driven into the ground, or made fast to the rocks. On each side of this suspension bridge there is another rope by which a person crossing may steady himself. Some people crawl along on their hands and knees, and others, less timorous, walk across; still the depth of the yawning abyss beneath, accompanied at times by the deafening sound of the foaming torrent that seems to shake the very rocks, renders this mode of crossing, even to those accustomed to it, fearful in the extreme.

Other bridges, when the narrowness of the chasms will permit, and trees of sufficient length are available, are formed by placing three, four, or more logs side by side. The Káfirs cross the smaller chasms and mountain-torrents of no great breadth, by means of leaping poles. In the use of these they are exceedingly expert, and being a particularly active race, can climb the steepest hills.

Horses, mules, asses, and camels, are unknown in the Káfir country; and burdens are either carried by bullocks or on men's backs, chiefly by a tribe of people designated Bárís, mentioned hereafter; although the Káfirs themselves do not disdain, upon occasion, to carry a load.

They possess numerous herds of cows yielding great quantities of *ghí* or clarified butter, a staple article of consumption, and of a superior description. The goats are most numerous, and are of a particularly fine breed, said to be much superior to those of the neighbouring countries; but sheep are few in proportion. They also rear an infinite number of fowls. Dogs and cats are common.

For the purpose of milking the cows and goats, the females go into the pastures, where they graze. When a woman wishes to milk her cows, she places the milk pail before her, and calls out the name of the cow she wishes to operate upon first; for all the animals have their peculiar names. On this the cow comes lowing towards her, and stands over the vessel. Having milked her, the woman sends her away and calls out the name of another cow, and so on until the whole have given up their milk, the greater part of which is made into butter, cheese, and curds.

The chief vegetable productions of Káfiristán consist of wheat, which is cultivated in a greater proportion than any other grain,

barley, and *arzán* or millet, together with small quantities of rice in the low grounds in the southern parts of the country : for only those who have been much among Muhammadans, and have seen it cooked, know how to boil it. A few varieties of vegetables and greens are grown wherever the land is suitable. They use the spring-water for drinking purposes, having no wells ; and the fields are entirely dependent on rain, or are irrigated artificially from the innumerable small streams intersecting the country, wherever the situation of the ground enables them to distribute the water by means of small cuts or channels. The quantity of land conveniently situated for this purpose is by no means great ; and it is necessary to cultivate all the smallest available spots on the sides of mountains, and often on the terrace-like ridges. Many of the latter are artificial, and formed after the employment of great labour, time, and perseverance ; indeed, no favourable bit of land, be it ever so small, is neglected. This somewhat unfavourable situation of the tillable land, and the often barren nature of the soil in many parts of the country, compels the people to depend, in a great measure, on the produce of their herds and flocks, and on their orchards and fruit-gardens, for subsistence.

The slopes and ravines of the Hindú Kush, as well as many of the lower ranges of hills, are generally covered with primeval forests, containing trees of immense size, the growth of ages, especially the different kinds of pine and fir, such as the deodár, chilghozah, and five or six other sorts ; the oak ; hazel ; alder ; zaitún (wild olive) ; chinár (plane) ; horse-chesnut ; díár ; shísham (*Sisu Dalbergia*) ; karkarah (species of fir) ; tút (mulberry) ; anandar ; joz (walnut) ; rút ; sanjit (jajube tree, or *Eleagnus orientalis*?) ; together with several others. In the year 1849, when the Bombay troops were at Pesháwer, the late Surgeon J. P. Malcolmson collected some twenty-five or thirty specimens of timber from the vicinity, amongst which were many hard, strong, and useful kinds of wood. Many of the specimens of fir and pine were dark and heavy from the quantity of turpentine they contained, and were just the same in appearance as the Riga deals we see in England.

The dense forests of pine and other trees supply the people of these Alpine regions with an inexhaustible stock of fuel, as well as

wood for building purposes. Pine slips are generally used instead of lamps and torches.

The fruits are produced in great quantities and of fine flavour ; consisting of grapes of several kinds, pears, apples, apricots, plums of two or three species, peaches, nectarines, figs, wild walnuts, quinces, pomegranates and mulberries. The whole of these are chiefly grown in the sheltered valleys to the south. There are a few others growing wild, such as the amlúk (a species of *Diospyros*), pistah (*Pistacia Lentiscus*), the seed of the chilghozah (species of pine), etc.

Numerous wild flowers, indigenous to these regions, grow in the hills ; and in the valleys, the *gul-i-nargis* or narcissus, is to be found in infinite numbers.

#### *Minerals and Metals.*

With regard to the mineral productions of these parts, it will be necessary to notice the regions of Hindú Kush generally.

The more elevated regions of Central Asia have ever been famous for the prodigious abundance of the precious metals, whether in ancient or in modern times—under the rule of the Medes and Persians, the Arabians, or the Moghals—as corroborated by every writer from Herodotus downwards ; and the proofs of these facts, are so well and so fully authenticated, as to leave no room for any reasonable doubts on the matter.\*

As far as we know hitherto, mountainous regions appear to be exclusively productive of gold and silver, from whence a great proportion is washed down by the violence of the periodical rains and melting of the snows, and deposited in the sandy beds of rivers.

The more western parts of the Asiatic continent appear to be but sparingly possessed of these metals, which are the more abundant towards the east. The regions I here more particularly refer to, comprise the ranges of the Hindú Kush ; the table-land of Pámir, separating Badakhshán from China and Kashmír—the probable seat of the old Medo-Persian race—and enclosing within its limits Káfristán ; Upper and Lower Káshkár ; the petty states north of, and in, the upper valley of the Oxus or Panj ; together with Gilgitt ;

\* HEEREN'S ASIATIC NATIONS. Vol. I. pp. 26.

Gundút;\* Hunzí; Nagyr; the Dárdú country; and other small independent states on the western bank of the upper Indus, from which several rivers flow in a south and easterly direction, and subsequently fall into the latter river. The streams, to which my remarks are principally confined, are the rivers of Káfiristán and Chitrál or Káshkár, the Panjkorah or Lundaey with its several tributaries, and the Gilgitt and its feeders. All these yielded, during the dynasty of the Persians, a great quantity of gold, which was collected by their tributaries, the people of northern India.†

Herodotus states, that the gold was not only collected from the sands of the rivers, but was also obtained from mines; and, that the Indians themselves paid to the Great King their tribute of thirty-six talents in that precious metal.‡

In these regions were placed the fabulous griffins who watched the gold; and the gold-making ants of the size of foxes—some of which, according to Ctesias, were to be seen in the menageries of the Persian kings—that rendered the collection of the metal a matter of great danger to the Indians. These little animals are also mentioned in the Sanskrit epic poem of the “Mahábhárata,” or “The Great War;” and instead of ants might, and indeed in all likelihood, have reference to a large species of marmot existing in these regions: for these, when making their burrows, throw out the fresh earth, amongst which quantities of gold were found.§

\* “There is a district N. E. of Chitrál which is called Gunjoot from the gold which is found in it.” BURNES’ CABOOL. This is the district called Gunjit by WOOD in his “JOURNEY TO THE OXUS.”

† HERODOTUS: THALIA III. 102-105.

‡ IBID: THALIA III. 106.

§ “The story has an Indian foundation, although it has been embellished by Grecian fancy, and its native form occurs in the Mahábhárata. “On the solemnity of the inauguration of Yudhishtira as universal emperor, his feudatories, princes, and people, bring him the natural or artificial products of their several countries, as complimentary offerings. Various mountain-tribes bring large lumps of the native gold denominated *Pip-líka*, because it is excavated by *Pip-líkas*,” that is by large ants, such being the meaning of the term; the Hindús apparently imagining that the ants cleared away the sand or soil, and left the ore exposed, and this simple notion was wrought into the extravagant marvels of Ctesias and Herodotus.” WILSON; ARIANA ANTIQUA; pp. 136.

The accounts of the ancients are further confirmed by the traditions of the people of these countries; and from the fact of the precious metal being found washed down by the rivers and minor streams in Káfiristán, Panjkorah, Bájáwer, Suwát, Gilgitt, and other valleys, west of the upper branch of the Indus, at the present day.

Gold, at present, appears to be chiefly obtained from the sands of the beds of rivers alone. Numbers of gold-washers are employed in the upper branches of the Kunir or Cheghán-sará'e river, at Peshút and other places; in the bed of the Chitrál or Káshkár, and its tributaries also; in the river of Kábul near Jelálábád; and in Káfiristán.\*

In Bájavar, Panjkorah, and Suwát, quantities of gold-dust are collected; indeed, much more than the Afgháns of these parts care to, or readily will, confess. They adopt another mode than washing the sands of the rivers, by half burying sheep-skins in the beds of the streams, allowing the wool free play, and in this the particles of gold becomes entangled. I am told by the Afgháns of these parts, that the gold thus obtained, is of a much paler yellow than that seen in the Panjáb and in India, being almost straw colour.

In the Gilgitt valley, and that of Hunzí, and Nágry, which open into it from the north-east, and also in Little Thibet,† the ore is principally obtained by washing,‡

\* "The rivers flowing through Káfiristán undoubtedly bring down gold with them. There are constantly a number of gold-washers employed near Peshút on the river of Chitrál and Kámeh (Kunir). The metal is also found in the rivers of Lamghán, and in the river of Kábul, into which they fall, and is sometimes collected near Kergah and Chárbágh of Lamghán, and again near Jelálábád." *MASSON'S TRAVELS*. Vol. I. pp. 213.

† "Nagyr is celebrated for its gold-washing, and its Rájá is said to be in possession of a very large piece of native gold, found near the edge of the boundary glacier (in the Basha valley) already alluded to." *VIGNE; KASHMIR* Vol. II. pp. 288.

‡ "On the banks of the Basha stream is produced more gold-dust than in any other part of Little Thibet, and it is the only place the Rájá reserves to himself for that purpose. Any other person may wash the sand for gold elsewhere, but the value of the quantity collected, and of the time expended, is so nearly balanced, that I have never seen any gold-washers but once, and that was near the village of Kerris." *IBID*, pp. 287.

Panjkorah, and the Beráhwol valley, situated between it and Bájawar, contain numerous iron mines, which have been worked for centuries past, and still continue to supply the surrounding countries with that useful metal. The principal mines are in the Lás-púr mountains, and the Jandáwal and Beráhwol hills, all of which are covered with dense forests, where fuel may be had for the trouble of cutting and carrying away. There are also several mines yielding, red, black, and white antimony.

### *Wild Animals.*

The wild animals of Káfiristán, and the regions north-east and east, are similar to those found in all the northern parts of Afghánistán, Kashmír, and Ladákh; and which have been so fully described by the Emperor Báber, in his interesting memoirs, and, likewise in the works of Moorcroft and Trebeck, and by Vigne, as well as other recent travellers who have written on the subject, as to render any notice here, beyond the mere enumeration of their names, unnecessary.

Lions, tigers and leopards, are said to infest the numerous ravines and dense forests, but they appear to be neither so fierce nor so large as those of central and southern India. In the more northern parts, as might be supposed, bears, both the black and the light dirty-brown species, are numerous, and make considerable and constant depredations on the gardens, orchards and vineyards. There are numbers of hyenas and wolves, which latter assembling in packs, at times commit great ravages amongst the flocks, together with jackals, foxes, and other smaller vermin.

In some of the warmer parts of Káfiristán, in the densely wooded districts, monkeys of the largest size are found, but are not very numerous; also several varieties of the deer, the antelope, the elk, the ibex, the kúchár or wild-sheep (*ovis argali*), the már-khúr, or snake-eater, etc. The musk-deer, called *sarjza'h* and *sijza'h* by the Afgháns, is found in Chitrál and Upper Káshkár, and in the hills bounding Káfiristán on the east. The Káfirs of the Kampar and Kámúz tribes employ a good deal of their time in hunting them for the sake of their musk, which is an article of barter. The wild hog is also found in some of the valleys towards the south.

The other smaller animals are, hares of two kinds, a species of rabbit or lagomys, porcupines, hedge-hogs, and marmots, together with numerous minor rat-like animals of several species.

The Gor-khar, or wild ass, is found in some parts of Panjkorah, Bájawar, and the Merrah or Desert in the country of the Yúsufzí tribe of Afgháns, between the mountains of Suwát and the Kábul river.\*

Ctesias gave an account of what has been considered the same animal, two thousand years ago. He calls it by the right name, but says it has a large horn in the centre of the forehead, and thus turns it into an unicorn.† Ælian in his "Natural History," has also referred to it, and has bestowed on it, what Professor Heeren calls, its Indian name of *Kartazonon* (καρταζωνος), and which Professor Tyschen again pronounces to mean the "swift animal," or the "swift rhinoceros."

This he infers to be, "a word compounded of كرك *kerk*, the ancient and still surviving Persian term in use to signify a rhinoceros," and "تازان *tázán* the participle of تازيدان *tázedan*, to run, to fall upon;"‡ but the Professor appears to have forgotten that the rhinoceros naturally requires marshy ground, and much water. As recently as Báber's time, that animal was found in the Pesháwer district, in the neighbourhood of the Kábul river, where there is water in abundance, and much marshy land.

We need not, however, turn the wild-ass into a rhinoceros, as Professor Tyschen appears to have done, nor go so far for the

\* It is also found in the Lower Deráját about Asuní and further south.

† "He (CTESIAS:) IND. cap. 25) tells us "That in the mountains of India the wild ass is found, which is as large and larger than a horse. His body is white, his head red, and on his forehead he has a horn an ell long, which towards the bottom is white, black in the middle, and red towards the tip. He is one of the strongest of all creatures, and so fleet that neither a horse nor any other animal is able to overtake him. When first pursued he runs leisurely; but by and by increases in speed. He defends himself with his horn, with his teeth, and his hoofs, and often lays prostrate many men and horses." Ælian has also given us the Indian name of this animal (ÆLIAN: HIST. ANIM: XVI. 20.) *Kartazonon* which Tyschen pronounces to mean the swift animal, or swift rhinoceros." ASIATIC NATIONS. Vol. I. pp. 98, 99.

‡ IBID: TYSCHEN, pp. 367, 368.

original of the, very probably, Hellenized word *Kartazonon*, which is evidently compounded of *خر*, *khar*, an ass, and *تازان* *tázán*, the present participle of the Persian verb *تاختن* *tákh-tán*, to run, etc.; thus combined—*khar-i-tázán*, “the swift or fleet ass.” Ælian’s designation for the wild-ass thus appears plain enough, the guttural *kh* of the Persians and ‘Arabs, having been dropped for simple *k*.

Other remarks, however, of Ctesias, that the animal in question possesses huckle-bones, leads me to believe that neither wild-ass nor rhinoceros is referred to; and gives me a ray of light in the matter. That author says he himself saw such a huckle-bone, which resembled that of an ox, but was as heavy as lead, and of a bright red colour; and moreover that “the animal was as much hunted for its huckle bones as for its horns.”\*

The Ghalzí tribe of Afgháns, at the present day, are passionately fond of a game played with a certain number of huckle-bones placed in a ring something like the game of marbles, and aimed at by the player with another huckle-bone discharged from between the finger and thumb. The huckle-bones of an animal known as the *takah* are particularly sought after on account of their size, strength, and great weight. These are coloured red by exposing them to the smoke of a fire. The game is called *bijal-bázi* from *bijal* a huckle-bone; and is very ancient. The animal is described as being about the size of an ass or pony; in figure like a deer, but more stoutly built. The hair is deep fawn colour, and grows to six or eight inches in length on the shoulders; belly white; horns long, black, and very stout, and sloping parallel to the neck; and from catching in the branches of the trees on the animal’s raising its head whilst grazing, often occasion its capture, which otherwise is very difficult from its swiftness, and its always keeping to the mountains. The *takah* is found in all the alpine regions of Afghánistán as far south as Kaláti-Ghalzí, and as far west as the mountains of the Hazárahjât between Kábul and Herát. This is evidently the *Kartazonon* which has puzzled the philosophers.

The rivers of Káfiristán and the surrounding regions of the Hindú Kush abound in fish; but they are not used by the Káfirs for food, being held in great detestation by them; and they do not appear

\* IBID : Pp. 335, 336.



to be relished by the Yúsufzí Afgháns. Otters are captured in great numbers, in the Chitrál or Káshkár, and upper branches of the Panjkorah rivers, for the sake of their skins, which are made into cloaks.

The birds consist of several species of the eagle and falcon, and hawks of many descriptions and great beauty, used by the Yúsufzí Afgháns of these parts, who are passionately fond of falconry. Afgháns formerly might have been constantly seen in the Kíssah Kh'ání Bázár, at Pesháwer, near the Kábul Gate, and also in the villages round, with hawks on their fists. These birds often fetch a high price, varying from ten to a hundred and a hundred and fifty rupees each, and sometimes more. The other birds are, wild-geese, duck, teal, and other water-fowl, kulang, cranes, herons, partridges, quail, chikor (the bartavelle or Greek partridge) which is larger than the common bird, and found in immense numbers on the sides of the rocky hills; the Impeyan pheasant, said to be of two or three kinds; jungle fowl; pigeons, doves, magpies, larks of several species, the goldfinch, bullfinch, sparrow, and other common birds.

Snakes and other venemous reptiles are few; but there is a species of snake, called the *kaochah* or *kawchah*, in Pushto, of a dirty earth colour with red spots, whose bite is mortal. It is very thick in proportion to its length, being about the size of a man's arm and under a yard in length, and altogether very repulsive in appearance. It infests rocky and stony places.\*

In tilling the land both in Káfiristán and the districts to the south and west, men and women alike assist. In the valleys, or wherever the land is sufficiently level, oxen are used for ploughing, at the rate of one to each plough; but on account of the generally irregular face of the country, the S'íáh-posh tribes, as well as their Nínchah and Muhammadan neighbours to the south and west, are obliged to sow their grain wherever they may be fortunate enough to obtain available spots of land. These mostly consist of narrow terraces or plateaux on the sides of steep hills, sometimes natural, but often

\* "The *gunnus* or *aphia* (οφις?) is said to be very poisonous; it is about a yard in length, and very thick, and its appearance altogether, I was informed, was very repulsive. It is found in rocky places on the eastern side of the valley (of Kashmír)." VIGNE: KASHMÍR Vol. II. pp. 21.

constructed at the expense of great time, labour, and perseverance, where oxen could not be brought; and in these places the soil is ploughed by hand.

The plough used by the Káfir tribes is a very rough and primitive affair, consisting of a piece of wood about eight feet in length, terminating in three prongs of about a foot long, and somewhat in the form of a trident, save that it is slightly curved towards the prongs or teeth. A rope of goat's hair is fastened to this machine, at the middle, and this the woman or man holds with both hands. Should the plot of ground be of any size, the back of the individual—generally a female—is turned from the plough; and with the rope over one shoulder, she pulls it along, whilst a man guiding and pushing it forward with one hand, scatters the grain with the other, from a little bag fastened round the waist, as he goes along. If the plot be small, as is generally the case, the woman stands on one side of the little field with her face turned towards the plough, whilst her husband, father, or brother, as the case may be, stands at the other. She then merely draws the plough towards her, whilst he guides it, and sows the seed as before described. By this method the soil, as may be easily conceived, is merely turned; but when an ox can be attached, it is done in a better manner. The ploughing and sowing having thus been completed, both persons go over the land again, and cover up the grain with their feet.

The principal harvest takes place in the autumn, and the crops, which are sown in the spring, greatly depend, as before mentioned, on the rain to bring them to perfection. When the corn is sufficiently ripe, it is cut down, carried home, and the grain separated from the straw by oxen treading over it.

Burnes, in his remarks on the Káfirs,—as quoted by the Edinburgh Reviewer—"imbibing the prejudices of his Muhammadan informants, calls the Káfirs a race of savages," and says, "There is nothing either in their customs or religion, which seems to be any way remarkable. The women *do all the out-door work*, and follow the plough: it is even said that they *are sometimes yoked in it along with an ox*."

Women, as I have related, assist the men in ploughing, as well as in other agricultural labours, and in the former case only where

oxen cannot possibly be brought for that purpose ; but in no instances are women yoked to the plough *along* with cattle. What is there more natural than that a poor uncivilized man, possessing but the bare necessities of life, and unable either to pay for, or to obtain help from others, should be assisted by his wife and children in tilling the scanty portion of land, on which they all depend for their daily subsistence ? Do not women, even in civilized and polished Europe, up to the present moment, work in the fields, and perform many other laborious duties, adapted for men alone ? and but too often to support an indolent and drunken husband and numerous family ? Hear what that honest writer William Howitt, in his "**RURAL LIFE IN ENGLAND**" says on this very subject. "A person from the South or Midland counties of England, journeying northward, is struck when he enters Durham or Northumberland with the sight of *bands of women working in the fields under the surveillance of one man*. One or two such bands of from half a dozen to a dozen women, generally young, might be passed over ; but when they recur again and again, and you observe them wherever you go, they become a marked feature of the agricultural system of the country ; and you naturally enquire how it is that such regular bands of female labourers prevail there. The answer in the provincial tongue is—O they are 'Boneditchers,' i. e. Bondagers. Bondagers ! that is an odd sound, you think, in England. What have we bondage, a rural serfdom, still existing in free and fair England ? Even so. The thing is astounding enough, but it is a fact. As I cast my eyes for the first time on *these female bands in the fields, working under their drivers*, I was, before making any enquiry respecting them, irresistibly reminded of the slave-gangs of the West Indies : turnip-hoeing, somehow, associated itself strangely in my head with sugar-cane dressing ; but when I heard these women called *Bondagers*, the association became tenfold strong.

"On all large estates in these counties, and in the south of Scotland (Burnes's own country) the bondage system prevails. No married labourer is permitted to dwell on these estates, unless he enters into a bond to comply with this system."

We all know how the women in this country from Pesháwer to Cape Comorin, work in the fields ; so we are, on the authority of Sir

A. Burnes, to consider the people of India as well as the people of England, to be “a race of savages.” The former “mild race” have certainly—no small portion of them—lately shown symptoms of being nothing better than savages and cannibals.

With the exception of a few slaves, the Káfir tribes send but little out of their country, the only exports being a little wine, vinegar, wax, and honey. They import all sorts of small goods, such as needles; horn-combs; scissors; small knives, of Kábul or Pesháwer manufacture, and very roughly made; balls of cotton; thread; coarse cotton cloth, called in India *kádi*; Loháni chintz—so called because brought into Afghánistán in the first place by the Loháni tribe of Afgháns, who are the great carriers of these regions; indigo for dying purposes, and also used by the women for making false moles on the face; gunpowder; lead and salt.

The Káfirs levy a tax termed *kalang* from the Muhammadans and Nímchahs, who dwell in the vicinity of their frontier, and who are unable to prevent their inroads, at the rate of one skein or ball of thread or cotton, and a Tabríz *sír* of salt, equal to about eight pounds English, for each inhabited house. Any one who chooses to invest an hundred rupees in the description of goods I have adverted to, will at the village border of Noyah be able to obtain two male or female slaves.

The Káfirs, by their own account, are divided into eighteen tribes,\* viz.; Kátí-hí; Sí'áh-posh—this word being, however, a Persian derivative, signifying *black-clad*, cannot be received as the real or original name of the tribe—Pashá-gar; Pán-dú; Wámah; Mandúl; Samá-jíl; Tapah-kál; Chánák; Dúh-tak; Sá-láo; Kaṭár; Kam-par; Ká-múz; As-kín; Ash-pín; Wadí-hú; and Wáe-kal.

They are termed Káfirs or Infidels by their Muhammadan neighbours; and also by the general designation of Sí'áh-posh, or black

\* MASSON, in his TRAVELS: Vol. I. pp. 214, makes the following *ex cathedra* declaration concerning the Káfirs, which I venture to contradict. “As regards the division of the Seaposh into tribes, none knows, or pretends to know, any thing about them;” yet in the same page, he goes on to say that; “on the Khonar (Kunir *not* Khonar) frontier, the nearest of their villages are Kattar, Gamber, and Delh Uz;” the first of which is the name and chief village of one of the eighteen tribes above mentioned.

clad, the same name as applied to the second tribe enumerated above; and by this appellation they are now principally known.

Some of the Afgháns distinguish them as *Tor* and *Spín* Káfirs—white and black—from a slight difference existing in the dress of some of the tribes, as mentioned in a subsequent page.

The different parts of the country they at present occupy, are as follows.

#### *Káti-hí.*

The people of the Káti-hí tribe have to a great extent become Muhammadans, but in name only; for they seem to be excessively ignorant of the simplest tenets of the faith. The chief or head-man of these is Muhammad Núr. The tribe was formerly settled in the *darah* or valley of Parchaghán, on the Panjsher river, where a few families, amounting to about 2,500, still dwell, along with a number of Hazárahs under Kadkhudá, Sayyid Mirzá, and also several Tájik families under Kadkhudá, Kází. The main body of the Káti-hís is now located in the country lying two days journey, (fifty miles,) north-east of the valley called Kandah-i-Níl, which is of considerable size, and takes its name from the source of the river rising in the northern part of Káfristán, and known to the people as the true source of the Æmán or Oxus. It lies to the north-east of the valley of Parchaghán, east of the Shúnah river, and north-west of the Lamghán district.

#### *Sí'áh-posh.*

This tribe originally dwelt in the *darah* or valley of Kási-gar. The country the Sí'áh-posh now occupy, together with a small number of the Pashágar tribe, lies to the west of the valley held by the Káti-hís.

#### *Pashá-gar.*

The Pashá-gar tribe formerly held the *darah* or valley of Sáe-kal,\* a portion of which, containing the four large towns of Dúmíah, Kandlah, Paranddol, and Tárhú, it continues to retain to the present time. The people of these places have become Muhammadans. Of the remainder of the tribe, who follow their ancient

\* "Leaving the dale of Nangnahár therefore, and pushing speedily forwards, we passed Sae-gal (or Sae-kal) and advanced up the valley of Birain." BÁBER'S MEMOIRS.

religion, some dwell in the country of the Sí'áh-posh, and some to the northward in the valley of Míl.

*Pán-dú.*

The Pán-dú tribe formerly occupied the *darah* or valley of Po-han ; and at present holds the eastern portion of the *darah* of Míl. Here they have several villages ; viz. Mukú-watú, the Kadkhudá, or headman of which is named Dáhwí ; Niw-lí ; Teylí ; Pándú and Parmah-wál, under Kadkhudá, Hasan. A very few only have become converts to Islámism. In this district, in particular, might makes the right ; and the authority lies in the hands of, or is seized by, him who has the greatest quantity of worldly goods, and the most numerous kindred. The *darah* of Najíl lies to the west of the valley of Míl.\*

*Wámah.*

The people of this tribe continue to dwell, in conjunction with the Tapah-kál tribe, in the valley of Inkár, which is connected with six smaller ones, named, Báyzíd, Bahan, Shankar, Makán-jú, Kadol-Khand, Landah-gáu, and Darah-i-Má'ísht. Some few of the people of the tribe have become Muhammadans ; but the greater number still follow their ancient faith, and look down on these converts with the greatest contempt, and compel them to dwell apart.

*Mandúl.*

This tribe formerly dwelt in the Shamah-kat valley, lying to the west of the Lamghán district, and containing fourteen smaller *darahs* or valleys within it. The Mandúls were driven from this locality as lately as the reign of the Moghal Emperor, Jehángír. They are now held by the Sáfís of the Ismá'íl clan, a small and independent tribe of Afgháns, but accounted among the Sulímán Khel of the Ghalzís. The Mandúls, at present, dwell in a portion of the valley of Kandah-i-Níl, which is also the present location of the Káti-hí tribe. The Mandúls retain their ancient religion.

*Samá-jíl.*

The Samá-jíl tribe in ancient times dwelt in the Shamakat and its contiguous valleys, along with the Mandúls ; and at the present day

\* "The part of Káfiristán nearest to Alishang is Meil (Míl) ; and the river of Alishang comes down from Meil." BÁBEL.

they occupy a portion of the valley of Kandah-i-Níl along with them and the Káfi-hís. None of the Mandúls have embraced Islámism.

### *Tapah-kál.*

The tribe of Tapah-kál is located in the valley of Inkár, which they have held for some centuries past, along with the converted Wámah families. The Tapah-kál are nearly all Muhammadans by profession, but are, nevertheless, considered by their neighbours of that faith to be worse than the unconverted Káfirs generally.

### *Chánák.*

The people of this tribe have all become Muhammadans, and retain their original district—the valley of Múkah—which contains fourteen villages of no considerable size. It lies to the west of Islámábád, a town of Lamghán, and south of Dúmíah in the Sáo-kal *darah*, held by the Pashágar tribe.

### *Dúh-tak.*

The Dúh-tak tribe formerly held the districts about Koh and Korinj, which form the angle between the river Kow and the Najíl or Alíshang, just before they unite at Tírgarí, a village of the Lamghán district. Some few of the Dúh-tak tribe have become converts to Muhammadanism, and now dwell in the Inkár valley, along with the small portion of the Wámah tribe, which has, as well as the generality of the Tapah-kál, embraced the same faith. The larger number of the Dúh-tak tribe, at present inhabits the country towards Chegán-sará'e, through which flows the river of Chitrál or Káshkár, (called erroneously the upper branch of the Kámah, but really another river falling into the Kámah here,) and on the borders of the country of Káshkár-i-Pa'in or Lower Káshkár, known also amongst the people of these countries as the territory of Sháh Kaṭor, but now ruled by his son Tajammul Sháh. This state will be hereafter described.

### *Sá-láo.*

This tribe in former times, held the *darah* or valley of Banáh-kot or Sá-láo, but for very many years past has been dwelling in that part of the centre of Káfiristán watered by the Shúnah river, towards the highest ranges of the Hindú Kush, also called the Shúnah valley. It lies to the west of the Káfi-hí country, north from Lam-

ghán, and to the eastward of the valley of Kandah-i-Níl. The people continue to follow their ancient faith.

*Kaṭṭár.*

This tribe continues to dwell in the *darah* or valley of Núrgíl, which they held in Báber's time. He thus notices them. "In the hill country to the north-east (from Kábul) lies Káfiristán such as Kaṭṭár and Gebrek;" and again—"Núrgíl lies to the west, and Kunir to the east of the river; and the lower part of this Tumán is called Milteh Kandí, below which the country belongs to *darah* Núr and Ater."\*

The Kaṭṭárs follow the religion of their ancestors, and are accounted by the Afgháns of these parts, as the most bigotted of the whole of the Si'ah-posh. Abd-ul-Hamíd, the Shekh Sa'edi, of the Pus'hto poets, thus refers to them in one of his odes.

كافران به د كتار مسلمانان شي كه رقيب مي په ژړا و ترسيده

The Kaṭṭár Káfirs will as soon become converts to Islám,  
As the guardian (of the beloved) be softened by my tears.

*Kampar.*

The country inhabited by the Kampar tribe is also situated in the valley of the Káshkár or Chitrál river, and to the north of the district of Núrgíl, in which the Kaṭṭár tribe dwells. The Kampars retain their ancient faith.

*Kámúz.*

This tribe inhabits the valleys lying to the north of the Kampar district of Núrgíl, and between the Káshkár river and the highest range towards Badakhshán, bounding the territory of Lower Káshkár to the south. They pay a small tribute to Tajammul Sháh in acknowledgement of his supremacy; but none of them have become converts to Muhammadanism.

The tract of country occupied by the three preceding tribes of Kámúz, Kampar, and Kaṭṭár, through which the Káshkár or upper portion of the Kámah river flows, is the most easterly portion of Káfiristán, and forms the boundary between them and the above named state, as also of Panjkorah and Bájawer. The tract here mentioned as inhabited by these three tribes of Kámúz, Kampar, and Kaṭṭár, is the same, in all probability, as that alluded to by



Báber on taking Chegán-sará'e in 1514, at which time, he says, the Káfirs of Pích came down to the assistance of the people of that place.

*Askín.*

The Askín tribe holds the upper valley of the Tagáb river, towards the highest range of the Hindú Kush. They have for the most part become converts to the Muhammadan faith, and are subject to Tajammul Sháh, son of Sháh Kaṭor. Those of the tribe who retain their ancient religion pay this ruler a trifling tribute.

*Ashpín.*

The Ashpín Káfirs dwell in the same district as the Askíns. Numbers of them have changed their religion, and are also subject to Tajammul Sháh of Lower Káshkár. The remainder are tolerated in their ancient religion on the same terms as mentioned with reference to the preceding tribe.

*Wadí-hú.*

The Wadí-hú tribe continues, as heretofore, to inhabit the *darah* or valley of Inkár. A few have become Muhammadans.

*Wáe-kal.*

The country of the Wáe-kal tribe, lies to the southward of Lower Káshkár, along the eastern bank of the Káshkár or Chitrál river, and bounds the Kampar district on the north. They have not changed their faith, but they pay a small tribute to Tajammul Sháh of Káshkár, in acknowledgement of his supremacy.

From the foregoing account, it will have been perceived, that, out of the eighteen original divisions or tribes into which the Sí'áh-posh are divided, only ten; viz., the Káṭí-hí, Sí'áh-posh, Pa-shágar, Mandúl, Samájíl, Sá-láo, Kaṭṭár, Kampar, Kámúz, and Wáe-kal, retain their ancient faith, and observe their former customs. They may be considered along with the tribes of Pándú, Wámah, Dúhtak, and Wadí-hú—a few only of whom have embraced Muhammadanism—as now constituting the whole of the real Káfir race; for the Tapah-kál, Askín, and Ashpín are for the most part of that religion; whilst the whole of the Chánáks have become converts to Islámism.

Those who have thus abandoned the religious observances of their forefathers, and who dwell in the valleys and hills bordering on the Afghán territories to the south and west, are called by the latter, *Nímchahs*; but they are by no means a separate race of people, as considered by Burnes and others, being really the converted portions of the Sí'áh-posh Káfirs I have above alluded to, and the descendants of those who have intermarried with their Afghán neighbours, or the offspring of Afghán females whom they may have captured in their forays. The very name of *Nímchah*, (نیمچه)—a Persian derivative from نیم *ním*, half or the middle, and چ *chah*, a particle added to nouns to form diminutives, and to express somewhat of contempt—alone would suggest this solution of the question; even if the valleys, which the *Nímchahs* are stated by those authors as inhabiting, did not exactly agree with the names of districts and tribes of the Káfirs, mentioned in the foregoing account, as residing in the vicinity of the Afgháns. The names of the valleys I allude to, are, Darah-i-Shúnah, Atú, Darah-i-Inkár, Darah-i-Wadí-hú, Mardamtak, Darah-i-Níl, Pándú Darah, Darah-i-Tapah-kál, and Darah-i-Máshamund; seven of which are inhabited at the present day by six out of the eight tribes I have noticed as having abandoned the religious customs of their ancestors, and become, in name, followers of the Muhammadan faith. The two tribes of Askín, and Ashpín, are not termed *Nímchahs* by the Afgháns, who know little of them, as they are subject to the Shah of Káshkár or Chitrál, and are very distant from the Afghán boundary.

As recently as the reign of the Moghul Emperor Jehángír, several families of the tribes inhabiting the valleys to the west of Lamghán, consisting of the *darah* of Shamatak, and fourteen smaller ones contiguous, embraced the Muhammadan faith. These places are now occupied by the small Afghán tribe of Sáfí.

In the reign of the sovereign just alluded to, we find from the Persian work entitled *Khulássat-ul-Ansáb* of Háfiz Ráhmát Khán, an Afghán of the Kotah-khel, that in his days, even, the Afgháns undertook expeditions against the Káfirs or Infidels of several parts of Afghánistán, taking their wives and children prisoners; and at the same time remarks, that the infidels of Darah Lamghán, Darah-i-

Pích, Darah Kuner, belonging to Kábul and Jelálábád, together with Tálaáh, Panjkorah, Chúmlah, Buner, Dramtáwer, Paklí, and other places, dependencies of Peshawer and Langerkot, were in this manner made converts to Islám.

The so-called Nímchahs continue to intermarry with the Káfirs and Afgháns indiscriminately. They also act as guides on either side, when the Káfirs attack the Muhammadans, or when the latter make forays into the country of the former, and sometimes even join in these expeditions. They are excessively ignorant of the Muhammadan creed, and most of them even appear ignorant of the necessary forms of prayer. They all drink a strong undistilled wine, which they keep a long time before broaching, another proof of their connection with the Síáh-posh tribes.

The Síáh-posh tribes have no history, as far as I can discover, by which we could attempt to trace their origin, neither have they any written character whatever; and the whole of the different tribes speak the same language. They, however, claim brotherhood with the Frangis; and during our occupation of Afghánistán, they attempted to enter into friendly intercourse with us, and even sent delegates from their country with this view, to the late Sir W. H. McNaghten, Bart., whilst at Jelálábád in 1839; but these simple-minded and confiding people were, in true John Bull fashion, harshly and coldly repulsed. The circumstance was thus related to me by an eye-witness, an officer who served in the Sháh's Contingent, and one of the prisoners with Lady Sale.

In the end of 1839, in December, I think it was, when the Sháh and Sir W. Macnaghten had gone down to Jelálábád for winter-quarters, a deputation of the Síáh-posh Káfirs came in from Núrgil to pay their respects, and, as it appeared, to welcome us as relatives. If I recollect right there were some thirty or forty of them, and they made their entry into our lines with bag-pipes playing. An Afghán Peon, sitting outside Edward Conolly's tent, on seeing these savages rushed into his master's presence exclaiming; "Here they are, Sir! They are all come! Here are all your relations!" Conolly amazed, looked up from his writing, and asked what on earth he meant; when the Peon, with a very innocent face, pointed out the skin-clad men of the mountains, saying, "There!

don't you see them? your relatives, the Káfirs?" I heard Conolly tell this as a good joke, he believing at the same time, that his Afghán attendant was not actuated by impudence in attributing a blood connection between his master and the Káfirs.

"The Káfirs themselves certainly claimed relationship; but I fear their reception by poor Sir William was not such as pleased them; and they returned to the hills regarding us as a set of purse-proud people ashamed to own our Country Cousins.

"During the remainder of our sojourn in Afghánistán nothing more was seen or heard of this singular race, at least not that I am aware of; and I cannot but regard it as most unfortunate, that, when so favourable an opportunity presented itself of becoming acquainted with these tribes and the country they inhabit, they should have been allowed to depart unconciliated, and no advantage have been taken of their visit."

The rare opportunity for sending a European Officer back with them to explore their country was thus, as usual, neglected and altogether lost.

The Káfir tribes appear to have been at enmity with their Muhammadan neighbours to the south for ages past; but they are generally on friendly terms with the people of Badakhshán and Chitrál or Chitrár, and Upper Káshkár, and occasionally enter into treaties with them.\*

Timúr made an unsuccessful attempt to reduce them when on his way to invade Hindústán, at which time, he detached ten thousand men against them. This force advanced to Inderáb, a town of Badakhshán, and thence proceeded by Ferijan, on the southern slope of Hindú Kush, into the Káfir country; and in the valley of Pohun—the former residence of the Pándú tribe—on the summit of a lofty mountain, known as Mount Káhun, the invaders found the remains of a vast fortress. This they repaired; and it is called "Tímúr Hissár," or "Tímúr's Castle," to this day. A more particular account of it will be found in another place. The Mo-

\* "The Káfirs are on good terms with the Chitrálís, and occasionally mix with them—my authority is the grandson of the exiled Rájá of Chitrál, who was driven out by Sháh Kuṭor. I saw him in Little Thibet." VIGNE'S GHUZNÍ KÁBUL, ETC. pp. 235.

ghal troops, however, seem to have met with but little success, and being unable to bring the Káfirs under subjection to their yoke, soon abandoned the attempt, and retired, somewhat precipitately, through the Kawak Pass.\*

The emperor Báber, in his "Memoirs" gives an account of his several forays into Káfiristán; but he does not appear to have entertained the idea of permanently occupying any part of the country, and probably saw the difficulty of such an undertaking from the determined opposition he met with from these hardy mountaineers.

About the end of the last century, the Muhammadan chiefs of Bájawer, Panjkorah, Kunir, and others, confederated together and entered the Káfir country, where they burnt some hamlets and forced several persons to embrace Islámism, and these are now included amongst the Nímchahs; but the invaders were soon compelled to retreat, after sustaining severe loss.

Five or six years since, the Bájawer chief made an inroad into that part of Káfiristán adjoining his own district; burned and sacked some villages; and succeeded in carrying off a number of people, whom he subsequently sold into slavery.

In mode of dress the Káfirs somewhat differ from each other; but all wear the black goat-skin garments, from which they derive the general name of Sí'áh-posh, or Black-clad.

The men wear a tuft of hair on the crown of the head, but the beard is worn according to individual taste—some never shave, others merely shave round the mouth, and others again cut off the beard entirely.

The dress of the Sí'áh-posh, Kámúz, Kampar, Katţár, and Wáe-kal tribes is precisely alike, viz.;—a shirt, drawers neither very tight nor very loose, and a *lúngí* or scarf, all of coarse cotton, besides a black dress similar to that worn by the fakírs or devotees at Kábul, consisting of a wide *chokah* or cloak with short, wide sleeves, made of a peculiar sort of wool. This they put on over the under-dress; and over all are worn the goat-skin garments. Herodotus† in his account of

\* HIST DE TIMUR BEC. Vol. III. p. 5.

† "The Caspians clothed in goat-skin mantles, and carrying bows made of cane peculiar to their country, and scimetars, joined the expedition. \* \* \*

the army of Xerxes, mentions several nations who dressed in a similar manner, consisting of tribes from the east and north-east of the Caspian Sea, and adjoining the Sea of Aral—the Caspii, the Utii, and others; as also the inhabitants of the mountainous regions on the south-eastern boundary of Great Bucharia, the people of Belúristán or Land of Crystal,\* Gilgitt, and others.

The remaining tribes—the Káfi-hí, Pashágar, Pándú, Wámah, Mandúl, Samájíl, Tapah-kál, Chanak, Dúh-tak, Sá-láo, Askín, Ashpín, and Wadí-hú, wear a dress called a *chaḡman*, which is sometimes brought to Kábul for sale, and is manufactured from wool of various colours; drawers called *buzo* also made of wool; and a shirt of coarse cotton cloth, as worn by the other tribes.

In the winter season, on account of the snow which lies on the ground for several months, in the more elevated districts, they are in the habit of wearing shoes of black goats-hair, woven strongly together; but in the summer they substitute the *chárúk*—a sort of half-boot made of goat-skin with the hair outwards, to lace up in front, and similar to the boots worn by the mountaineers of Panjsher, who are, by all accounts, converted Káfirs, and the shoes of skin with the hair on, worn by the Scottish Highlanders.

Few of the Káfirs cover the head; and when they do so, it is with a narrow band or fillet made of goat's hair of three different colours—red, black, and white—about a yard or a yard and a half in length, wound round the head.

The females dress in a similar style to the women of the Kohistán or Highlands of Kábul, viz.; loose drawers tight at the ankle; a long shirt or chemise; a *chádar* or veil; and a small scull-cap under which the hair is plaited.

Their ornaments or trinkets consist of flat bracelets on the wrists, necklaces, and ear-rings, and rings on the fingers. Those of the rich

The Pactyes also wore goat-skin mantles, and had bows peculiar to the country and daggers." HERODOTUS: BOOK VII. Polyhymnia 67. The Pactyes here referred to are the inhabitants of Pactyice, supposed to be the present district of Paklí, on the left bank of the Indus just above Aṭṭak, but more probably the little known parts on the opposite bank, to the north of the districts held by the Yúsufzí Afgháns.

\* See description of Káshkár and Chitrál.

are mostly of silver, and rarely of gold; whilst the ornaments of the poorer classes are generally of brass and copper. The men wear rings in the ears and on the fingers only.

Those females whose fathers or husbands may have slain one or more Musalmáns, have the peculiar privilege of ornamenting their caps and locks with *kaurí* shells.\* Young virgins, instead of the scull-cap, fasten a narrow fillet of red cloth round their heads, which they adorn with shells, if entitled to the privilege.

The manners and customs of the different tribes are alike: they celebrate their joys and their griefs, their marriages and their funerals, after one and the same fashion.

When a guest enters a house, whatever eatables and wines are at hand, are immediately set before him. When he has finished his repast, the people of the house eat, but not before. If the visitor should be a Muhammadan, or of any other religion than their own, they bring him a goat or a sheep that he may slaughter it himself according to the custom of his own faith; and after he has selected a portion for his food, which he is also permitted to cook himself, the family take the remainder for their own use.

After a guest has once crossed the threshold, the master of the house alone waits on him; the brother of the host, or the other members of his family being prevented from supplying the stranger with anything, even water to drink, without his sanction, so much do they respect the rights of hospitality. In the same manner, no person of the village where the guest may be staying, is allowed to entertain him without the consent of the host. If this be done, quarrels arise, in which lives have been frequently lost.† With the

\* *Cypræa moneta*.

† BURCKHARDT remarks, "Among the Arabs of Sinai there is a custom which, I believe, is common to several other tribes on the southern limits of Syria, that if a stranger be seen from afar coming towards the camp, he is the guest for that night of the first person who descries him, and who, whether a grown man or a child, exclaims, "There comes my guest." Such a person has a right to entertain the guest that night. Serious quarrels happen on these occasions; and the Arabs often have recourse to their great oath.—"By the divorce (from my wife) I swear that I shall entertain the guest;" upon which all opposition ceases. I have myself been frequently the object of such disputes, in which the Bedouin women took a very active part, assembling in the females'

sanction of his entertainer, a stranger is permitted to visit the other people of the village, the headman in particular; and, on entering a house, at whatever hour of the day it may be, wine and victuals are immediately placed before him, of which he is pressed and expected to partake.

The guest, whether male or female, sleeps in the same apartment with the family; and all, it is said, are in *puris naturalibus*. I suspect by all accounts, however, that the meaning of the word "naked" is, that they take off their outer garments when they retire to rest, a natural and cleanly habit, and far preferable, in many ways, to the custom of their Musalmán neighbours, who sleep in the same dress they wear throughout the day.

Last year (1848) a Káfir of the Kátí-hí tribe came to the Muhamadan village of Moyah, where he put up at the house of an acquaintance. When bed-time arrived, the Muhammadan host, pointed out to his Káfir guest where he was to sleep. The latter became exceedingly angry and said, "You came to my house and slept in the same place as my wife and children slept in, whilst I being your guest, you have given me a separate place to sleep! what sort of hospitality is this?" The host, after much trouble and entreaty, at length succeeded in pacifying the Káfir by making room for him in the sleeping-place occupied by his wife and family.

The Káfir towns and villages, several of which contain three and four hundred houses, are almost invariably built on the steep acclivities of the mountains, on account of the general irregular nature of the country they inhabit, and also, as being better in a defensive point of view, in case of invasion. Some few are situated in the valleys and on the table lands, towards the northern parts of the country. They never dwell in tents; but some are said to dwell in caves.

Their houses are generally built of stone, in frames of wood, with flat roofs, and of one story in height. Some dwellings contain, according to the means of the owner, several rooms, furnished with

apartment of the tent where I sat, defending the rights of their husbands with all the loquacity that their lungs could supply. It is a received custom in every part of the Arabian Desert, that a woman may entertain strangers in the absence of her husband. Some male relation then does the honours, representing the absent owner of the tent." "NOTES ON THE BEDOUINS AND WAHABYS."



wooden benches or tables, stools made of wood, and sometimes of wicker-work covered with goat-skin: for the Káfirs cannot squat down in the Oriental fashion; and in this point, in particular, they bear a striking resemblance to Europeans in being unable to sit-cross-legged with any comfort.\* Their beds are made of wood, and similar in form to the Indian *chárpáe*—a simple frame with short legs, over the frame of which they lace bands of leather.

The Sí'áh-posh tribes are rich in herds of oxen and cows, and flocks of sheep and goats, the latter of a very superior breed. They also rear immense numbers of fowls.† They eat beef, but the flesh of sheep and goats, particularly the latter, is more commonly consumed, as also the game they capture in the chase, such as deer, antelope, ibex, —the antlers of which they set up in their places of worship—and the *kúchár* or mountain sheep, and other smaller animals. They sometimes eat the flesh of bears, but this is very seldom. Burnes describes them as eating monkeys, which is not truly the case; and as far as I can discover, these animals, if they really exist in the country, are extremely rare. Monkeys are found generally in tropical climates, not in such localities as the valleys of the Hindú Kush, where snow often lies on the ground for months together, and which are surrounded on all sides by mountains capped with the snows of ages. It is possible, that, in the more sheltered valleys—which are said to be much warmer than the nature of the country and climate might lead us to expect, and where grapes attain great perfection—these animals may be found, but only in small numbers.

Their other articles of food, consist of unleavened bread, milk, curds, butter, honey, a few herbs, vegetables, and fruit, which latter their country produces in great quantities, and of excellent flavour.

All classes of people drink a great deal of wine,‡ as do most of the

\* LIEUT. WOOD in the account of his journey to the Oxus, says of a Káfir he met with—"Crossed-legged he could not sit, for in this respect the Káfirs differ from all eastern nations, and like Europeans prefer a chair, or anything raised, to a seat upon the ground."

† "In the winter season they fatten numerous poultry." BÁBER'S MEMOIRS.

‡ "In this sequestered tract of country grapes and fruit are produced in great abundance, and it also produces a large quantity of wine, but in the making they boil it. The people are wine-bibbers—they never pray, neither fear God nor

inhabitants of the neighbouring countries professing the Muhammadan religion—the Chitrális or Káshkárís, who are considered to be of the same stock as the Káfirs—the people of Gilgitt, and Gunjut, belonging to Yásin—the Badakhshánís and the Nímchahs, who are either converted Káfirs, or descendants of those who have intermarried with their Muhammadan neighbours. On public occasions the Káfirs are very liberal with it, and it is put into vessels and placed in convenient places, where all who come may help themselves. There are stringent regulations regarding picking the grapes before a certain day, and great care is taken in their cultivation.

The wine is much better in flavour than in appearance, and does not seem to be of a very intoxicating nature, judging from the deep potations in which they indulge, without becoming over excited or quarrelsome. In the manufacture they boil it, and use it without filtering, which is the cause of its untempting appearance.

Bread, the staple article of food, is made from three different kinds of grain—wheat, barley, and *arzun* or millet mixed together and ground into flour in a hand-mill. This is made into thick cakes or bannocks, baked in an oven, or on an iron dish, called in Scotland a “griddle,” suspended over the fire.

Their method of slaughtering cattle is strange and superstitious. The animal intended to be killed is brought out, and is seized by the head by one man, whilst a second strikes it a blow on the neck with a sword or long and sharp knife. If the head is severed from the body by one stroke, which is generally the case, the flesh is considered pure and fit for food, but if not, they give the carcase to the Bárís, a certain tribe residing amongst them, held in the light of Pariahs, or as Helots amongst the Greeks, and who would seem to be the remnant of the aboriginals of the country—the Paropamisidæ of the classical authors. These people carry on all the mechanical trades, such as blacksmiths, weavers, carpenters, cutlers, etc. The Káfirs themselves look upon such occupations as mean and disreputable, and consider the profession of arms and agriculture alone to be creditable. On jour-

man, and are infidels. So prevalent is the use of wine amongst these people, that every Kafir has a *khig* or leathern bottle full of wine hung round his neck, for they drink wine instead of water.” BÁBER’S MEMOIRS.

neys these Bárís are employed to carry baggage, and in all meaner occupations.

It is a mistaken idea to imagine that the Káfir tribes sell their own children, as Burnes mentions, at the rate of twenty rupees the span. Whenever the people of Chitrár or Chitrál, and Lamghán, who are generally at peace with them, come into their borders for the purpose of barter and for purchasing slaves, they sell them the children of the Bárí tribe, before alluded to. Yet, uncivilized as they are, it is rather improbable that they would show much hesitation or compunction, for a good reward, to kidnap and sell their neighbour's children if opportunity offered; nevertheless, it is of rare occurrence.

All broken victuals are kept for these Bárís, who sometimes come and stand behind a person whilst eating, to receive whatever may be left unconsumed. But if a Bárí chances to come in front of a Káfir whilst eating, it is considered defilement, and the aggressor is well abused, and soundly beaten also for so doing; and cases have been known wherein Bárís have been killed by the enraged Káfirs, although the commission of the capital crime is likewise accounted defilement.

Some few years since, a man of the Wámah tribe, on an occasion of this nature, in a fit of rage killed a Bárí, and from that day to this his own wife has neither lived in the same house with him nor eaten in his company; and whenever she happens to see him, she says, "Oh mean one! thou hast slain a Bárí: thy hand is unclean!"

Once every year the Káfirs hold a grand and ancient festival which continues from twenty to forty days. Great preparations are made for its celebration; and large quantities of wine, clarified butter, fruit, and other eatables, are collected by the people before hand. On this festive occasion they do not eat at home, but visit their acquaintances in rotation, with whom they remain four and five days at a time. When the day arrives, a large cauldron of clarified butter, which has been set aside for the purpose, is kept ready heated in every house; and round it drinking vessels are arranged. Every person who enters the house is expected to take a cup-full from the cauldron and drink it off, otherwise it is accounted an insult, and enmity immediately springs up. During this festival, the villagers

assemble together in the open air and make merry. The men perform a sort of war-dance; and the women fasten little bells round their waists and dance together. Their only musical instruments are a sort of tambourine, a pipe or fife, together with a description of bag-pipe.

The day preceding the termination of the feast, the whole of the people—male and female, young and old—congregate on the green in front or in the centre of the village, where all assemblies take place—the females on one side, the males on the other; and feasting and carousal—singing and dancing—are kept up with great spirit, until about midnight, when on a given signal, the lights are suddenly extinguished; the men rush on the women; and each man seizes the hand of the nearest female, or one whom he may have selected before hand, if he can manage to approach her in the scuffle which now ensues. He then takes her away to some private place and retains her until the morning. On these occasions it makes very little difference who the fair one is, whether his own wife or that of another—his own daughter or sister or another's; and as might be supposed, very ludicrous, as well as painful mistakes, are apt to occur. This particular day is called the Chilum Chutí (چلم چطي), and takes place about the Hindú month of Sirád.

This horrid scene of debauchery is similar to that enacted at the festival in honor of Venus, celebrated by the ancient Babylonians; and which is mentioned by Rollin in the following terms. "There is nothing more horrible, or that gives us a stronger idea of the profound darkness into which idolatry had plunged mankind than the public prostitution of women at Babylon, which was not only authorized by law, but even commanded by the religion of the country, upon a certain annual festival, celebrated in honor of the goddess Venus, under the name of Mylitta, whose temple, by means of this infamous ceremony, became a brothel, or place of debauchery. This wicked custom was still in being and very prevalent when the Israelites were carried captive to that criminal city; for which reason the prophet Jeremiah thought fit to caution and admonish them against so scandalous an abomination."\* These licentious rites are similar to those instituted by Pír Roshán, the founder of the Roshánian sect, amongst the Afgháns, in the sixteenth century.

\* ROLLIN. ANCIENT HISTORY. Vol. I. pp. 219, 220.

Several of the Káfir customs, and that just related, in particular, bear a strong resemblance to those of the Yezidis or Devil Worshipers, mentioned by Morier in his "Travels." He says:—"The Yezidis, or the worshipers of Satan, as they are frequently called, are one of the numerous sects which were formed in Mesopotamia, among the Musalmáns, after the death of their prophet, and extended themselves more particularly among that ancient people, the Kúrd.

"By the true believers they are looked upon as accursed; their name is synonymous with blasphemers, barbarians, and men of blood. Owing to the want of written records, it is very difficult to procure any accurate information concerning them, as they preserve great secrecy in matters of religion. The general report is, that the first principle of the Yezidis is to ensure the friendship of the devil, and to defend his interests by the sword. They never mention his name, and even adopt all sorts of circumlocution rather than pronounce any word or sound which expresses it. Whoever approaches their habitation must be careful not to pronounce the word "*Shaitán*" and "*láhnat*"—"devil" and "accursed," for fear of being ill-treated, or even put to death. The evil spirit has no precise name in their language. They designate him the Shekh Mazin, or the great chief. They admit of the Prophets and the Saints revered by Christians, and respect the monasteries bearing their names, situated within their territories.

"Without prayers, without fasts, without rites, they have no religious festivals, except one on the 10th of August, when they assemble in great numbers in the neighbourhood of Shekh Adi. At that time many Yezidis come from the most distant points; the festival lasts all that day and the night following; and during their passage to the place of congregation, they do not scruple to rob and plunder. Married women go in numbers to the surrounding villages, and on that night it is said, after having eaten and drank their fill (male and female together) the lights are extinguished, and nothing more is said until the morning."

To return to the Káfirs—The day succeeding the Chilum Chutí, and the last of the festival, all the people assemble together, and those who are desirous of making an inroad into the territories of their Muhammadan neighbours, get up and stand on one side. On this,

one of the elders, or chief men of the tribe arises, and like a *Kowál* or Bard proceeds to harangue the audience on the deeds and the prowess of their ancestors; how many Muhammadans they had killed in their lifetime; how many of their villages they had plundered and destroyed; and enjoins them to take example therefrom. If there should be any one amongst the assembly, distinguished for his actions against the enemies of their faith, they are recounted and enlarged upon, as also the deeds of any other individuals the orator may recollect.

When the Bard has finished his address, the people, with the exception of those who have come forward to invade the country of their enemies, disperse to their several homes, and the latter make arrangements for their departure on the crusade.\*

Until they have matured their plans, and the expedition is ready to depart, no individual of the party either eats or sleeps in his own dwelling; and in whosoever house he may happen to be in the evening, there he sleeps for the night.

When the morning arrives for the warriors to set out, the people of the village or villages, as the case may be, give them provisions and wine for their journey; and those requiring arms are supplied with them. Some conspicuous hill or other place is then determined on, at which a beacon-fire is to be lighted on their return, in order that the villagers may come out to meet them. The necessary fuel or combustible for this beacon is then got ready and piled up at the appointed place; and in case any one might be so malicious as to set fire to the pile, or that it might accidentally take fire, all other persons are strictly forbidden to approach the spot, under pain of severe punishment.

Having shared the food and wine given to them by the villagers, each man places his portion in a small goat-skin bag, kept for this purpose. Before leaving the halting-ground every man conceals under a stone or in some other place, a day's provisions to serve him

\* "The Spartans never went to fight without first imploring the help of the gods by public sacrifices and prayers; and when that was done, they marched against the enemy with perfect confidence and expectation of success, as being assured of the divine protection, and, to make use of Plutarch's expression, as if God were present with, and fought for them." ROLLIN: ANCIENT HISTORY, Vol. I., pp. 236.

on his return. This is done each morning before setting out for the next stage.

The war-party having arrived near the borders of the territory of their foes, determine on some spot as the base of their operations; at which place also they agree to meet, if possible, every night. On this arrangement being completed, they roam throughout the hills, forests, and valleys, in search of enemies—sometimes alone, and sometimes in parties of two or four, and at times in larger bodies. In the evening they meet together at the place agreed upon, and relate to each other the adventures of the day, and the number of Muhammadans they have killed.

A few years ago the Sífáh-posh had no fire-arms whatever amongst them; but at present they are much better provided with flint-lock pieces than the people of the Kohistán of Kábul, Lamghán, Badakhshán, or Panjkorah. Where these fire-arms come from, I cannot discover—probably, they are of Russian manufacture, imported by way of Kokán to Chitrál, with the people of which latter state they are on friendly terms. I see no other route by which they could obtain flint-lock pieces, unless made in the Panjáb or Kashmír, and thence carried into their country by way of Gilgitt and Chitrál. The Afgháns have, generally, match-locks only.

The original weapons of offence used by the Káfirs are bows and arrows, the former about four feet in length, the latter nearly two; and a long and broad knife of a peculiar curved shape, and about two feet in length. They also use a smaller knife, about twelve or fifteen inches in length, for cutting their food with. Some few possess swords, the spoils of their enemies.

They so much exceed the Muhammadans, by whom they are surrounded on all sides, in point of intrepidity and skill in their mode of warfare, that, hitherto, none of their enemies—save for a very short period, and then only in far superior numbers—have been able to oppose them with success.

Their mode of fighting is, to lie in ambush near the villages and grazing grounds of their enemies; for they very rarely attack them openly or in large numbers. Being very strong and active, they seem particularly fitted for stratagem, in which they are infinitely superior to their neighbours.

If a Muhammadan falls into the hands of a party of Káfirs, and they kill him, they gain no honour thereby collectively; the credit alone attaches to him who may have first laid hands on the victim.

Those who have succeeded in slaying an enemy, will not eat or drink in the company of their less fortunate comrades; but each as he succeeds in killing a foe, is again received into their society. Those who cannot accomplish the task must be content to remain separate from the others.

They go on in this manner, day by day, for twenty days or a month, on the expiration of which time, if the expedition has turned out tolerably successful, they set out on their return; and on arriving at the beacon, fire it, in order to warn their friends in the village of their approach. The villagers—young and old—rich and poor—male and female—come out to meet and conduct them in triumph home. Those who have killed a Muhammadan in the foray, are raised on the shoulders of the crowd, before whom the young maidens dance, sing, and clap their hands, until they reach the hamlet. Those of their comrades who have not been so fortunate, have to follow behind on foot; and until they succeed, on some future expedition, in killing a follower of Islám, they are not allowed to sit in the assembly of the tribe, neither to eat nor drink with their fellow-countrymen, and are excluded from participation in all public diversions. They become, in fact, outcasts of society, are not at liberty to marry, and are not even permitted to cook victuals for themselves, but must live by beggary; and food is handed to them over the giver's left shoulder; even their own wives and children look upon them with contempt. When they have succeeded, however, in taking the life of a Muhammadan, they are re-admitted to their rights as freemen, and become honorable men again.

These stringent and severe customs bear a striking resemblance to the warlike system of the Spartans, towards those who fled from a stricken field or survived a defeat, who were thereby deprived of their rights as freemen, and were subject to all sorts of indignity and contumely.\* Herodotus also quotes a similar usage prevailing

\* "Hence it is that a mother recommended to her son, who was going to make a campaign, that he should return either with or upon his shield: and that another, hearing that her son was killed in fighting for his country, answered,



amongst the Scythians. He says :—" Once every year, the governor of a district, each in his own circuit, mingles a bowl of wine, from which those Scythians drink, by whom enemies have been captured : but they who have not achieved this, do not taste of the wine, but sit at a distance in dishonour ; this is accounted the greatest disgrace. Such of them as have killed very many men, having two cups at once, drink them together."\*

To escape from this disgrace as soon as possible, it may naturally be imagined, that these unsuccessful foragers lose no opportunity in going again to seek their enemies ; and that the young men require no stronger stimulant to urge them to the destruction of their natural foes. Those who, during their life-time have never volunteered to set out on one of these expeditions, or may never have had the opportunity of so doing, are not subjected to these rigorous rules, which only refer to those, who, of their own free will, have set out for the express purpose of making an inroad into the territories of their enemies, after the termination of the annual feast ; still, all who have not killed at least one Muhammadan during their lives, are not held in much esteem.

Notwithstanding the natural animosity of the Sí'áh-posh Káfirs towards the followers of the Prophet of Mekka, who constantly make inroads into their country for the purpose of capturing and carrying off slaves and cattle ; and, that the former lose no opportunity in making reprisals, and are constant in their endeavours to destroy them, as enjoined by their religion and ancient custom, as will have been seen from the preceding remarks : yet when a Musalmán throws

very coldly, " I brought him into the world for no other end." This temper of mind was general among the Lacedæmonians. After the famous battle of Leuctra, which was so fatal to the Spartans, the parents of those that died in the action congratulated one another upon it, and went to the temples to thank the gods that their children had done their duty ; whereas, the relations of those that survived the defeat were inconsolable. If any of the Spartans fled in the battle they were dishonoured and disgraced for ever. They were not only excluded from all posts and employments in the state, from all assemblies and public diversions, but it was reckoned scandalous to make any alliances with them by marriage ; and a thousand affronts and insults were publicly offered them with impunity."

ROLLIN : ANCIENT HISTORY. Vol. I., pp. 236.

\* HERODOTUS : BOOK IV. Melpomene. Chap. 66.

himself on the generosity, and places faith on the word, of a Káfir, he treats him in the most hospitable and generous manner. If one of the former people falls by chance into the hands of the Káfirs, when not on their yearly crusade, and says that he is a friend or acquaintance of a certain Káfir of a certain tribe, they release him; and even if such person happens to be accompanied by a second party, he has merely to say, "This man is my friend, and I am the friend of such and such a Káfir (mentioning his name) of a certain village," in order to obtain his companion's release also.

If a Sí'áh-posh and a Muhammadan wish to enter into a truce of friendship, as they sometimes do with the people of Badakhshán and Chitrál or Káshkár, but rarely with the more cruel and bigoted Afgháns, they exchange weapons, and until these are again returned, they remain at peace; but after they have been given up, the friendly intercourse ceases, and the fire of enmity burns as fiercely as before.

Another custom is to kill a goat and dress the heart, of which each of the contracting parties takes a portion, and afterwards salute each other; but this mode of agreement is not so binding as the former, which is considered sacred. This latter mode of making covenants with their enemies, is something similar to that described by Mr. Elphinstone in his work on the "Kingdom of Kábul."

The Káfirs follow a different practice in entering into agreements amongst themselves. These are made in the following manner. They take a piece of gold, or a golden ornament, and place it in a cup filled with water, and the terms of the compact or promise having been stated, each of the contracting parties drinks off a small quantity of the liquid, after which the agreement is binding. This form they designate *sún-wuruk* (سون ورك), or *sún-ao-wí* (سون اوي), *sún* being the term for gold, and *wuruk* or *ao-wí*, the name for water. Another method is to take a piece of salt which each party tastes, and the bargain is complete. This method, however, is observed amongst most eastern people.

Somewhat similar usages to the foregoing were prevalent amongst the Medes; and are mentioned by ROLLIN in the following words. "The manner these people had of contracting an alliance with one another is very remarkable. Besides other ceremonies, which they had in common with the Greeks, they had this in particular—the

two contracting parties made incisions in their own arms, and licked one another's blood."\* HERODOTUS also describes an analogous custom of entering into engagements as observed amongst the Scythians. He states:—"The Scythians make solemn contracts in the following manner, with whomsoever they make them. Having poured wine into a large earthen vessel, they mingle it with blood taken from those who are entering into covenant, having struck with an awl or cut with a knife a small part of the body; then, having dipped a scimitar, some arrows, a hatchet, and a javelin in the vessel, when they have done this, they make many solemn prayers, and then both those who make the contract, and the most considerable of their attendants, drink up the mixture."†

If a young man falls in love with the daughter of any one, and wishes to marry her, he takes an arrow, which he has previously covered with blood, and discharges it into the house of his mistress's parents or guardians, as the case may be; but at the same time taking good care that the arrow injures no one. He then goes away to one of the chief men of the village and acquaints him of the circumstance. The girl's father, or master, if a slave, having discovered the arrow, makes enquiry amongst his neighbours if they know who has discharged it into his dwelling. On this, the confidant of the lover comes forward, and makes known the name of the party, and proposes to the tribe that the girl be given to him in marriage; and if they agree, which is generally the case, they fix the amount of dowry, consisting of cows, goats, sheep, land, and ornaments; and these must be made over to the damsel's parents, or master, by the intended bridegroom, on or before a certain day. If he has sufficient property of his own for his marriage expenses, it is well, otherwise the tribe raise a subscription amongst themselves, and set him up in the world.

The day for the celebration of the marriage having been fixed, the people of the village and the neighbouring hamlets are informed of the same, and invited to attend the festival. The father feasts the guests sumptuously for a period of from five to ten days according to his means, during which time singing and dancing are kept up

\* ANCIENT HISTORY. Vol. I., pp. 146.

† HERODOTUS; BOOK IV. Melpomene. Chap. 70.

with great spirit, accompanied by a sort of tambourine and a pipe or fife. On these occasions the wine is not spared.

On the last day but one of the festival, the father gives his daughter whatever dowry his means will afford, and which generally consists of a suit or two of clothes, a few brass or silver ornaments, a few goats, some household utensils, and if his circumstances will permit, a cow or two. Rich fathers add one or more slaves.

On the last day of the bridal, the bride and bridegroom are decked out in their best apparel, and brought into the centre of the place where the guests are assembled together. A goat is then brought; the bride is placed at its head, and the bridegroom at the tail. One of the elders present, then rises up, and stands at the side of the goat, between the couple; and commences to relate the warlike and virtuous actions of their respective ancestors, and exhorts them to follow their example and live happily together. After he has concluded his address, he slaughters the goat, which he gives to a priest as his fee; and the bridegroom takes his bride away to his own home: and thus ends the marriage ceremony.

The age for marriage is from twenty to twenty-five for males, but mainly depends upon whether the person can afford to support a wife. The period of marriage for females varies from fifteen to twenty years of age, and even older. Polygamy is rare, although not considered unlawful; but it is only men, well off in the world, who can afford to purchase female slaves. Adultery also is of rare occurrence, and its punishment is divorce.

In some of their customs and ceremonies, the Síáh-posh tribes bear a strong resemblance to the Gabrs or Fire-Worshippers, known in India by the name of Pársís.

Within a short distance of every village, there is a building erected, and entirely set apart for the reception of females during certain periods, and also after child-birth, when they are considered impure.

On a female becoming aware of the first mentioned circumstance, she must at once retire to the building referred to; and clothes bedding, food, and such other things as she may require, are brought to her. After some days, she bathes, puts on clean clothes, and returns home.

In cases of child-birth, the parturient woman is removed as quickly

as possible after the signs of labour are apparent, to this general lying-in house, where she remains with her offspring for a period of forty days, during which time every thing she may require, is brought to her. After the expiration of the forty days, she performs her ablutions; puts on clean apparel; and returns home with her child.

During both the periods referred to, a female must on no account put her hand to any vessel used for food, or for drinking purposes. If she should do so, it must be destroyed: for her touch is considered pollution.

On the demise of any person, the females wail and beat their breasts, as is the custom throughout most eastern countries. A likeness or image of the deceased, whether male or female, is then made of wood, and as like the defunct as possible. Should he have been blind, or have lost an eye, the image is thus represented; and they even go so far in their imitation, that if the deceased had any marks or scars on his face or body, however minute, or any other peculiarity whatever, the same is portrayed on the wooden image. When this has been completed, the body being first arrayed in its best apparel, is placed in a wooden coffin, the lid of which is well fastened down; and is afterwards conveyed to the place of cemetery, situated about a quarter of a mile in front of each village, or as nearly opposite as possible. The women, weeping and wailing, precede the corpse, which is placed on a cot or sort of bier; and borne by four or six persons; the men at the same time follow chaunting the praises of the deceased. When the corpse is set down occasionally to relieve the bearers the men dance round it, at the same time continuing to chaunt in a low voice.

On reaching the burying-ground, the coffin is set down and left in the open air, and the procession returns home. After this, it is necessary that the relations of the deceased person should kill an ox or cow, according to the number of guests to be entertained, besides sheep and goats, and give a feast, at which the wine is not spared.

M. M. Huc and Gabet, in their interesting account of travels in Tartary and Thibet, mention the manner in which the nomadic tribes of the desert expose their dead. One mode bears a strong resemblance to the Káfir practice of exposing their dead bodies.

They say :—"The manner of interring the dead among the Tartars is not uniform. The Lamas are only called in to assist at extremely grand funerals. Towards the Great Wall, where the Mongols are mixed up with the Chinese, the custom of the latter in this particular, as in others, has insensibly prevailed. There the corpse is placed, after the Chinese fashion, in a coffin, and the coffin in a grave. In the desert, among the true nomadic tribes, the entire ceremony consists in conveying the dead to the tops of hills or the bottoms of ravines, there to be devoured by the birds and beasts of prey."\* Exposing the dead to ravenous animals is also prescribed by the precepts of the Mágí. The way in which the Gabrs or Pársís of the present day expose their dead in the Towers of Silence, is so generally known as not to require description.

In religious matters the Sí'áh-posh tribes appear to be exceedingly ignorant, and their few forms and ceremonies are idolatrous. They consist chiefly of sacrifices of cows and goats to their deities, whom they call Shurúyáh, Lámání, and Pándú, which latter, the name would lead us to suppose to be one and the same with the deity of the Hindú pantheon known under the name of Yudhishtira.

They have hereditary priests who assist at the different feasts and ceremonies, and who are supported by voluntary contributions, and a double share of victuals and wines at festivals. Their influence is very slight; and the elders and chief men of tribes appear to hold all authority.

Each village contains a temple or place of worship, differing but little from the dwellings of the people themselves, and in which the wooden representations of the three deities before mentioned are placed. The walls are generally ornamented with the antlers of deer.

Fire appears to be necessary in most of their religious ceremonies; and a Káfir has great antipathy to extinguish it by water, or even to blow out a flame with the breath;† yet they do not keep up the

\* TRAVELS IN TARTARY AND THIBET (Illustrated London Library) Vol. I. pp. 77.

† LIEUT. WOOD remarks as follows of the inhabitants of Badakhshán. "I have elsewhere mentioned the repugnance with which a Badakshee blows out a light. Similar lingering remnants of Zoroaster's creed are to be detected here

sacred fire like the followers of Zartúsht, and do not even seem to know anything concerning it. At the same time, a number of their usages bear great resemblance to those of the Gabrs, of whom they are probably an off-shoot, but whose characteristics have gradually declined during the many centuries they have been separated from the parent stock. The Badakhshánís and others, inhabiting the surrounding countries, are probably descended from the same race.

The Mágíán religion was not exclusively confined to Media, but extended to the east to Bakhtra, (in which the royal residence was first situated,) and as far as the stupendous mountains of the Indian Caucasus and the valley of the Oxus, the whole of which extensive tracts of country—where numerous ruins attributed to the Gabrs still exist—were included in the mighty empire of the Medes. It is also evident from the Zendavesta, that it was in these regions the religion of Sápétman Zoroaster “first took root and flourished, and thus it became the parent land of the civil institutions of the Medes.”\*

Several authors claim for the Sf’áh-posh tribes Hellenic ancestry, but on what grounds does not appear. They themselves do not put forth a claim to such illustrious descent; but they pride themselves on being brothers of the Farangí, and according to the traditions preserved among them, they affirm, that coeval with the spread of Islámism, they occupied the countries to the south of their present location, and have been subsequently compelled to seek for liberty and for safety, among the mountains and valleys of the Hindú Kush, from the insupportable tyranny of their Muhammadan neighbours whom they designate *Awdál*. They appear, therefore, unquestionably to be the remnant of the aboriginal inhabitants of the country to the south of the Kábul river and central Afghánistán as at present constituted. This is confirmed by the traditions of the Afgháns also; from the existing histories in the Pus’hto or Afghán language;

(Wakhan.) A Wakhani considers it bad luck to blow out a light by the breath, and will rather wave his hand for several minutes under the flame of his pine-slip, than resort to the sure, but to him, disagreeable alternative.” JÓURNEY TO THE OXUS.

\* HEEREN: “ASIATIC NATIONS.” Vol. I. pp. 149.

and from the writings of other Muhammadan historians.\* From these we find, that in the time of the Ghazníwid Sultáns, the Afghán tribes finding the Káseghar district—situated immediately west of, and including within it the slopes of the Sulímán mountains, forming the western barrier of the Indus, in which they had for centuries past been located—much too contracted to yield a subsistence to such a numerous people as they had now become, were compelled to encroach upon the territory to the west and north-east, towards the Kábul river; and were in the constant habit of plundering the infidels, or Káfirs, as they called the original inhabitants of the country, making slaves of them and of their wives and children; and compelling all those who did not seek safety in flight, to become converts to Islámism. These events took place during the chieftain-ship of Malik Abdál, from whom the whole of the Afghán tribes are often called Abdálís, or, by substituting the letter *w* for *b*—a change common in the Pus’hto and Iráníán languages—Awdálís, hence the name given them by the Sí’áh-posh as already related.†

The people of Chitrál and Káshkár, and according to Wood, the chiefs of the tribes of Roshán and Shaghnán—two mountain districts lying in the valley of the Oxus, immediately to the north of Durwáz—claim lineage from the Macedonian conqueror himself. But until these countries shall have been explored by some intelligent European traveller, we cannot arrive at any certainty on this head.‡

Akhúnd Darwezah, the venerated saint of the Afgháns, and opponent of Báyzíd Ansárí, founder of the Rosháníán sect, traces his

\* See Introduction to my PUS’HTO GRAMMAR, (second Edition): Hertford, 1859, and JOURNAL OF ASIATIC SOCIETY OF BENGAL. Vol. XXIII. pp. 550.

† This is also confirmed by the account of Malik Manir quoted by MASSON in his “TRAVELS.” “He says; In company with Malik Sir Buland of Chaghan-serae, I went to the Kafir town of Kattar. The Káfirs themselves call the Muhammadans *Odal*, and say that they have driven them to the hills, usurping the plains, and eating up their rice.” Vol. I. pp. 233.

‡ “The chief of Wakhan traced his ancestry to Alexander the Great, a descent, whether fabulous or true, of which he is not a little vain. Muhammad Rahim considered his illustrious lineage a fact which none dare dispute, and indeed his neighbours spoke with equal confidence of his high claim. This honor, as other travellers have remarked, is not confined to Wakhan, but is one to which the rulers of Badakhshán, Darwaz, and Chitrál are also aspirants.” “WOOD’S JOURNEY TO THE OXUS.”



descent from the ancient kings of this region, who claim Macedonian origin.

The safest mode of entering the Káfir country, is to get one of them beforehand to become security, after which a person may go from one end of it to the other without the slightest danger. For a European, the best and safest route, I should say—and the one I myself would not hesitate to follow—would be by way of Gilgitt to upper Káshkár or Chitrál. In penetrating into Káfiristán from the south, the greatest, and I may say, the sole danger, is from the Yúsufzí Afgháns, whose territory of Panjkorah must be passed through; although, with slight trouble, and a little negociation with the chief, Ghazan Khán, I dare say this obstacle might be soon surmounted by a European acquainted with the Pus'hto and Persian languages.

When foreigners enter the territory of the Sífáh-posh tribes, they are treated with great kindness and hospitality; but they try by every means to induce strangers to remain, and even offer them their daughters in marriage as an inducement. If a man once allies himself to one of their females, it is extremely difficult to get away again. Their boasting that the Farangí are their brothers, would appear a sufficient guarantee for the safety and kind treatment of any European who may penetrate into their secluded valleys.

The Káfirs have European features and a highly intellectual cast of countenance. They have both blue and dark eyes, arched eyebrows, long eyelashes, and broad open foreheads. Their hair varies in colour from black to lightish brown; and both males and females are tall and well made, and of handsome figure. Some of the females are said to be particularly beautiful. They all go about unveiled.\*

\* LIEUT. WOOD thus describes a Káfir that he met with in Badakhshan. "He was an uncommonly handsome man, of about twenty-five years of age, with an open forehead, blue eyes, and bushy arched eyebrows, his hair and whiskers black, and his figure well set and active. Crossed legged he could not sit, for in this respect the Káfirs differ from all eastern nations, and like Europeans prefer a chair or anything raised to a seat on the ground. He gave us an animated account of his countrymen, and pressed us to visit them when the passes opened. As an inducement to do so, he promised us plenty of honey and oceans of wine," "JOURNEY TO THE OXUS."

In summing up the character of this unsophisticated and highly interesting race, I may remark that they appear by all accounts, and even from the descriptions of their enemies, to be of a merry and sociable disposition ; and though quick to anger are as easily appeased. Hospitable to a fault, they treat their guests more kindly than brothers. Even their enemies allow that they are as sincere in their friendship as in their enmity ; are faithful to their agreements ; and hold boasting, lying, and duplicity, in sovereign contempt.

Lieut. Wood, in the interesting work, "*A JOURNEY TO THE OXUS*,"—to which I have already several times referred—remarks concerning them (in which I most cordially agree) that, "They resemble Europeans in being possessed of great intelligence, and from all I have seen or heard of them, I consider they offer a fairer field for missionary exertion than is to be found any where else on the continent of Asia. They pride themselves on being, to use their own words, brothers of the Farangís ; and this opinion of itself, may hereafter smooth the road for the zealous pioneers of the Gospel."

Fortunate indeed will be that man who has the opportunity of first exploring these regions ; and still more so he, who is destined to disperse the dark clouds of idolatry which now hang over them, by the bright light of Christianity.

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*Account of Pergunnah Mahoba, Zillah Humeerpore, Bundelcund.—*  
*By G. H. FREELING, Esq., B. C. S.*

The re-settlement of Mahoba having become necessary by the expiration of the old leases, it was accomplished during the cold weather of 1855-56, and a report submitted for the sanction of Government, of which the annexed paper is an extract, comprising all those portions relative to the former history, topography, and products of the pergunnah, but omitting all the Fiscal review, bases of assessment and classification of soils, which naturally formed the most important part of the report itself, but which seem rather to belong to the revenue record of the province than to be suited to the pages of this journal. Want of leisure has prevented the matter being put in a more popular shape, and must excuse the somewhat formal paragraphs into which its official character necessarily compressed each head.

*Introduction.*

Mahoba Proper is situated to the South of the Humeerpore district, distant from the Sudder Station 55 miles, and from the Cantonments of Banda and Nowgong, 36 and 34 miles respectively. The Pergunnah is bounded on the North by Jelalpore of Humeerpore and Kundeh of Banda; on the East by Banda, and the Native States of Gouriar and Chirkharee; to the South by the Chutturpore territory and the Oormel Nuddee; and to the West by another portion of Chirkharee and the Pergunnahs of Jeitpore and Punwaree.

In former days, Mahoba played a very important part in the history of India, and its princes held sway over a large portion of the Peninsula. The works of old poets abound with legends of the heroes to whom it gave birth, and for many generations before the Muhammadan conquest, the different races of Thakoors, who held their court there, were among the most celebrated of that warlike period. To trace them through all their changes would, in such a report, be out of place; but it may be interesting to notice briefly, from a comparison of the different papers which have been published on the subject, the principal mutations which have at length reduced the capital of the Chandels to a British Pergunnah.

*King Rug.*

The inhabitants talk a great deal of a King Rug, of whom all they know is, that he reigned in the days to which their earliest traditions refer ; of him, however, I find no authentic history, so proceed at once to the Chandels, who, according to Major Ellis, are descendants of Chandra Brahma, (perhaps the same as Chandrama the " Moon,") whose mother, Hemavati, erected as penitential monuments the temples at Kujraha in Chutturpore, about Sumbut 682. Twenty-one of his descendants followed consecutively, and were the founders of most of the great buildings in Bundelcund, and have perpetuated their names by the lakes and reservoirs built by and called after them.

Pamál Deva, the 22nd in descent from the founder, and the last of any note, gravely insulted the Chouhan King of Delhi, Prethee Raj, and was slain by him in battle at Bairagarh, near Orai, about Sumbut 1247. His son Brimaditya met also with defeat and loss from the same monarch ; the Chandels left their ancestral lands, and emigrated to Mirzapore, Azimgurh and elsewhere to the East.

*The Banafers.*

The Banafers also, whose origin Elliot refers to Mahoba, acquired great celebrity at the time, from the valor of Ala and Oodul, in the contests with the Delhi army. Many are still to be found in the Pergunnah and in the neighbouring one of Punwaree.

*The Chouhans.*

After the final defeat of Brimaditya, Chouhan garrisons occupied the country, but on the Muhammadan invasion of India, by Mahmood of Ghuzni, and the fall of Delhi, Mahoba, with other Hindu States, became also tributary to the conquering power.

*Muhammadan Rule.*

From this time to that of the Boondelas, little is known of the state of this part of the Empire. Its greatness had departed, and it had sunk into a dependant province. Legends, however, are not wanting among the people, of the presence of their monarchs in person among them, especially of the powerful Ala Eddin Ghorî.

*The Boondelas.*

The glory, however, of Bundelcund, as it now came to be termed,

was destined again, in some degree, to revive, in the persons of the Boondelas, a Rajpoot tribe of spurious descent, a branch of the royal race of Guhurwars of Casee.

The accounts of their rise are various ; Franklin assigning it to the time of Timour, when the tribe under Dewada Bir are said to have established themselves in Mhow ; while Elliot refers them to a somewhat earlier period, the beginning of the 13th century, when, “ after the Chandels had been humiliated by the Chauhans, and they, in their turn, had been compelled to yield to the supremacy of the Musulmans, the country round Mahoba, must have been in so distracted a state, as to have invited the attack of the first Chieftain who could muster a band of followers sufficiently strong to maintain their occupation.

For the first two or three centuries of their rule, they were at times independent, at times nominally acknowledging the Muhammadan authority, until, in A. D. 1640, Pahár Sing was installed and confirmed by the Emperor Shah Jehan in all the possessions of his ancestors.

About this time, Champat Rao, a Chief of some note, settled at Mhow, and made himself notorious by his predatory exploits. His son, Chuttur Sal, who had been absent in the wars of the Deccan, and also in the Mahratta service, returning, settled at Punna, overthrew the neighbouring chieftains, seized their territories, and rendered himself so powerful, that Ahmed Khan Bungesh, of Furruckabad, was sent with a large force to reduce him to obedience. In the face of this overwhelming army, he applied for aid to the Peishwa, Sivajee Bajee Rao, and with his aid defeated the imperial troops, and made himself supreme in Bundelcund. Fearing, however, the increasing power of the Mahrattas, he, at his death in 1731 A. D., bequeathed one-third of his possessions to his powerful ally in hopes that, by that means, he might secure the rest to his children : in this share Mahoba was included.

#### *Mahratta Government.*

Mahoba having passed as an integral part of Saugor, and Jalown, to the Mahrattas, notwithstanding the attempted resistance of Bridaya Sah, and Jugat Raj, the sons of Chuttur Sal, which was repressed by Holkar, an officer of his army, by name Casi Pundit, was

entrusted with the Government. His son, Gobind Rao, succeeded ; but being slain in conveying supplies to the Mahratta army, during the Abdallee invasion, the management of the province was confirmed to his family, and his sons, Balajee and Gungadhur, conjointly succeeded. At their death, the elder branch took Saugor, and Gobind Rao Pundit, known as the Nana Sahib, became sole master of Jalown, including Mahoba. He, dying in 1879 Sumbut, left a son Bala Rao, who following his father in 1888, left no heir. His widow, however, was permitted by the British Government to adopt any one she pleased, and her devise fell on her own brother, Gobind Rao.

This was very displeasing to several relations of the late Chief, and internal discord was the consequence. The Exchequer became embarrassed, and the possessions were mortgaged, piece-meal, to greedy farmers, who tyrannized over their peasantry.

#### *British Interference.*

To put an end to this, the agent to the Governor-General made a report in June, 1838, which resulted in the temporary sequestration of the district of Jalown, which was placed under Lieut. R. Doolan to be managed for the young Chief's benefit, during his minority.

#### *Final Annexation.*

On the 11th October, 1840, Gobind Rao died at Banda, not yet 17 years of age, and there being no direct heir, the order of annexation followed shortly after, and the superintendent appointed two years before in the name of the young ruler, was confirmed on behalf of Government—the administration of the Province being regulated, so as to resemble that previously introduced into Saugor.

Capt. Ross succeeded in 1842, and Capt. Erskine in 1848, under whose management it was, when, in May 1853, Mahoba with Jeitpore was transferred to Humeerpore in exchange for the Pergunnahs of Koonch and Calpee.

#### *Physical Geography.*

The general aspect of Mahoba is very unlike that of most parts of these Provinces, though the same as the neighbouring district of Banda, and great part of independent Bundelcund. A spur of the great Vindhya range extends its extreme point in this direction,

causing ridges varying from a single rock to hills of several hundred feet in height, to rise in all directions out of the plain of black land, which seems the natural face of the country.

The rock so appearing is, in all instances, primary:—granite traversed in many places by veins of quartz running North and South. This is of all degrees of coarseness—in some places of the finest grain—in others so loosely held together by the feldspar as to decompose, giving character to the surrounding soil. That a little harder, affords, on the side exposed to the weather, a convex surface in general; and in other places, from the suppression of the mica, quartz, or horn-blende, it assumes the character of syenite green stone, and clink stone, the green stone being particularly abundant about Mahoba Khass.

#### *Soils.*

The soils of Bundelcund have been so fully described by Messrs. Allen, Muir and Edgeworth, that I can only give a resumé of what they have already written.

The chief varieties, here as elsewhere, are Mar, Kabur, Pundooah (called in Humeerpore, Purwah and Parooah) and Rakur.

*Mar* is a rich black soil, occurring generally in plains of many hundred biggahs in extent, said by Dr. Adam to contain more argillaceous earth and carbonized vegetable remains than is found in lands to the North of the Jumna. It is peculiar for its power of retaining moisture, and the rifts and cracks, which its contraction through drought causes. In the rains, it forms a mire of so clayey a nature, as to render roads made through it impassable. It is hence reserved exclusively for rubbee crops; wheat, gram, and âl being the principal.

*Kabur* is very similar to Mar, but lighter both in character and colour. The crops on it are not so good, gram being the favourite. It is not much sought after by cultivators; it bears high rates, and is very uncertain; an excess, or want of rain being equally injurious.

*Pundooah* is a light earth of a yellow brown colour, very favourable for cotton and almost exclusively used for sugar-cane in consequence of its fitness for irrigation.

Of *Rakur* there are two kinds, termed “motee” and “patree.” Of the former more will be said when treating of rates, as it does

not appear to be a separate soil; the latter is the poorest of all soils, and as its name denotes, is hard and stony. When the rains are favourable, it gives good khureef crops, but any lack of moisture causes a failure. Its power is soon exhausted, and it requires to lie fallow, and recover itself after every two or three years.

*Khera* and *Kachar* are classes of soil, deriving their names rather from position and circumstance, than from being in themselves different.

*Khera* is that land, generally near the village, which is manured and irrigated from wells, it may be of many species and often is *rakur*. The treatment it receives, however, makes it fertile and the garden cultivation takes place in it, in which case it is termed "*kachwara*."

*Kachar* is the land in the vicinity of streams, or overflowed by lakes in the rains. It is generally rich, and of necessity confined to rubbee crops.

#### *Lakes.*

One of the great peculiarities of this Pergunnah is its lakes or tanks, which are to be found in the neighbourhood of most of the villages. They, in general, date back to the time of the Chandels, and in many instances the names of the founders have been preserved, as in Mudun Saugor and Keerut Saugor at Mahoba itself, made by Mudun Brahma and Keerut Singh, the father and grandfather of that Parmal Deva, of whom mention was made before.

They generally are faced with rough stones of large size, arranged so as to form steps, with ghâts of coarse white granite in immense slabs; above which, in many instances are the remains more or less perfect of temples of the same material. Lieutenant Burgess is of opinion, that they were in former days, used exclusively for irrigation, and the remains of bunds, now broken, in regular succession on the line of stream through the Pergunnah, would seem to confirm the notion. The largest is Beejannugger, near Mahoba, which is nearly two miles long, and a very fine sheet of water, lately made available for irrigation.

#### *Streams.*

Rivers, there are none in the Pergunnah, though several of the streams rising in the hills become considerable ere discharging



themselves into the adjacent large rivers, the Kane and Betwa. Thus the Chundrawul Nuddee, which forms an important addition to the Kane shortly before it reaches the Jumna, rises near Mahoba; and the Oormul Nuddee, another tributary of the same stream, is the Southern boundary of part of the Pergunnah. The Kane likewise has its springs here, as also the Urjoon which joins the Burna, and with it the Betwa below Jellalpur. In every instance save the last mentioned, the current is to the Eastward; and all but one dry up after the rains are over, the Oormel alone retaining water in its hollows.

### *Irrigation.*

As in the regulation Pergunnah so here, irrigation as a general means of increasing the fertility of the soil is unknown, which may be ascribed partly to the abundance of land compared with the number of cultivators partly to the fact, that so much of the soil is unfavourable to the practice. In but one instance, viz. at Naigaon, have I seen the "doogla," so universal in the Doab, used here. In some instances, land situated below tanks is watered from them, by cuts being made in the bund; or, when the proximity of lakes ensures the water being close to the surface, kutchha wells are dug, at a cost varying from 1 to 10 or 12 Rupees, which last one hot season, and fall in at the beginning of the first rains.

In some few villages also where *Pundooah* is the prevalent soil, and sugar-cane much cultivated, these are more abundant, especially towards the south; but the practice is by no means general.

Latterly, irrigation has received a great impulse from the efforts of Lieutenant Burgess; who, by constructing extensive works at the Bejannugger Lake, and raising the bunds and escapes of several of the neighbouring ones, has caused a large quantity of land, previously waste, to be brought under the plough, much too producing the more valuable crops.

### *Products.*

The tabular statement in appendix No. 1, shows the quantity of land under each kind of crop, as furnished by the Khusreh survey; and appendix No. 2, gives the principal exports and imports, which are treated of more fully under the heading "Trade." From the former, it appears that the chief product of

the khureef or summer harvest is "jowar," which occupies nearly a third of the whole area cultivated; while, contrary to what is the case generally, "bajra" finds little favour: cotton stands next, and then "sesame" and "kodo." In the "rubbee" or winter harvest, wheat occupies more than half the whole cultivation, and among the others "pulse" (unkhud) stands foremost, and barley, while "ál" also takes a very fair rank.

There are but two species of cultivation on which I would particularly remark,—*sugar* and *pawn*.

The former is grown very extensively throughout the Pergunnah, and is a favourite crop wherever the *pundooah* soil predominates, and water is either available from tanks, or near enough the surface for wells to be dug at little expense (they cost ordinarily from 1 to 9 or 10 Rupees, and last sometimes one, sometimes two years, according to the rains). The sugar produced is generally inferior, owing to the poor cane sown. Instead of choosing the best for seed, any, the most valueless is used.

The peculiarity of this cultivation, however, is, where there is no water obtainable, the want is artificially supplied by what is termed "pulwar." After the cane is planted, the whole surface of the field is covered over, to the depth of three to six inches, with leaves, grass and straw, which retains all the moisture the ground receives from dew or showers, indeed acts as a species of hot bed; and the sugar so produced seems equal to any other. This mode of cultivation is, it seems, proper to Bundelcund.

After writing the above Mr. C. Jackson informed me that this mode of raising sugar is also prevalent in the Agra district.

The *pawn* gardens (bareja) of Mahoba are well known all over the provinces, and the leaves form a large item of export to the Doab, up to Delhi and Agra; indeed sepoy tell me that, in the Punjab war, the Mahoba pawn was even there in great request. It has been grown from time immemorial, the soil, tanks, &c. being especially suited to it. The great requisite is an abundant supply of water, and this the lakes of course afford. The cultivation is conducted by a caste termed "Burai," and the export trade and sale by another, called "Tambowlee." There are three localities in the Pergunnah where it is carried on, Mahoba Khass, Didioara and Baregurh.

The plant is a creeper, resembling the convolvulus, but, they say produces no visible flowers or seed, (this may be because it is a perennial, rooted up after the first year) it is propagated by cutting off the upper part, where the leaves are too tender for sale, and every slip from joint to joint takes. The land is carefully prepared, and oil cakes, of the husks and stalks of the tillee, used as manure.

In "Phagoon" and "Bysagh," the cuttings are planted at a distance of three or four inches apart, in straight lines termed "cor," along light bamboo frames six feet high, allowing a passage between them of about two feet broad. The top and sides of the gardens are protected from the sun by screens of grass interwoven with bamboos, and give the whole a most curious appearance from without, especially as the doors are of the same material, and very small, so as to be scarcely discernible.

In the height of the hot winds every line requires careful watering, from earthen pots, four to eight times a day according to the heat; but after the rains once every three or four days is sufficient and the leaves are then plucked throughout the cold weather beginning at the bottom and largest ones. Each plant, on an average furnishes twenty leaves; or one "dolly" of two hundred leaves (the measure they are sold by) is ordinarily produced from ten plants. The price of these dollies varies by quality; those of mixed large and small leaves, fetch from one to three annas in ordinary seasons, while the superior ones, all of first quality, rise to six and seven annas at the gardens.

The land is generally given on "thausa" leases, at from ten to twenty rupees a beegah, but occasionally, as this year in Didwara, the cultivators refuse, and prefer paying per line of one hundred feet.

### *Singhara.*

The tanks throughout the Pergunnah, are naturally, most favourable to this crop, which is exclusively cultivated by men of the Dheemur caste, and is to be found in most villages. In the end of January, the seed or fruit is scattered, at the rate of a maund to a local beegah, over the water where it is sufficiently deep to preclude any idea of its drying up before the rains. It is then pressed into the mud by sticks, or the feet (very deep water being

therefore never used), and in a month begins to sprout. In June, just before the rains set in, the excess is thinned out and transplanted, the produce of one beegah serving for three or four; the roots being taken between the Dheemur's toes, in a curious manner, and thus fixed in the mud. The leaves appear on the surface of the water, beneath which in October the fruit forms, and is gathered in November and December.

The produce sells commonly at from ten to twenty seers per Sreenugger rupee, and a local beegah produces from three to four maunds. The measure is by bamboos 18 feet long, twelve by two forming the singharra beegah, which pays from one to three rupees rent, the nature of the soil telling in this as in other crops; a stony bottom being very unfavourable. The community of Dheemurs, however, generally take the lake on a "thausah" lease, and divide it among themselves, their respective cultivations being marked by upright sticks, the removal of which as of boundary marks on shore, leads to many a quarrel.

Their great enemy is an insect called "baudu," which, in both stages, of grub and fly, feeds on the plant, eating through the husks, and thus destroying the fruit, which on being exposed to the water, spoils. The labour of killing these and clearing away weeds, is very great.

For the cultivation flat bottomed canoes are used, scooped out of the trunk of a single mohwa tree, costing about five rupees each to make, and lasting fifteen to twenty years. They carry two men, and are pushed on by bamboos; and when not used are sunk in the water till again wanted.

#### *Castor plant.*

The castor plant (*Ricinus vulgaris*) so very common about Humeerpore and its neighbourhood, is scarcely known here; it is occasionally grown by kachees in little patches; but in only one village, "Karee Pucharee," have I seen a field of it.

#### *Gardens.*

Garden cultivation is frequently to be met with, but is by no means universal. Pepper and vegetables are grown, but by far the most common crop is tobacco, of which large quantities are produced in the northern part of the Pergunnah.

*Grass and Hay.*

The absence of any large Military station from the neighbourhood, and the large tracts of uncultivated land and hills about, obviate the necessity of setting aside any fields especially for hay. The inhabitants of every village are allowed by the zemindars to cut the grass they want, but "rakhels" in the strict sense of the word, are not met with. The village of Futtehpore is perhaps an exception ; the land not being good and adjoining Mahoba Proper, the owners find their advantage in selling the hay, but this is the only instance where any profit seems derived from this source.

The "Kaus" grass (*Saccharum spontaneum*) prevails here as elsewhere in Bundelcund, and in some villages, especially those on the borders of Banda, is a grievous enemy to the husbandman. It rears its wiry head in the midst of the rising crops, and when once established, is nearly impossible to eradicate. Indeed Mr. Edgeworth (learned in all plants and their habits) declares that the very attempt to remove it by disturbing the earth round its roots only gives them new strength.

The presence of this weed is a certain sign of good land, as it only flourishes in the best black soil. There is one village Bela, which, possessing as fine land as any in Mahoba, has of late years been quite overrun by Kaus, and does not return one-fourth of its former produce. Mr. Cust of Banda has proposed treating any village where it appears as a case of alluvion and diluvion, and in the justice of his scheme, I fully concur.

*Forest Trees.*

Jungle must formerly have abounded throughout the Pergunnah, in many of the border villages much even now remains : generally a low brushwood, of which the wild "corinda" and "khyr" tree are the most common elements. The "Chool" bush is also very prevalent, and is a valuable addition, being useful in all its parts. The leaves are used for dishes, at weddings, feasts, &c. by all castes ; the fibres of the roots form a rope which does not swell or spoil in the rains, water improving and strengthening rather than injuring it, and from its charcoal the best native gunpowder is prepared.

Groves are very plentiful and invariably of the mohwa tree

(*Bassia latifolia*) which furnishes the native spirit sold in the bazars; the mangoe, as is usual this side of the Jumna, being of very rare occurrence. The former governments greatly encouraged planting all kinds of trees, granting patches of land rent-free for the purpose to any one who would take them.

#### *Animals.*

The gradual clearing away of jungle, and increase of cultivation have naturally thinned the number of the larger beasts of prey in Mahoba; wolves and hyenas are still, however, found in some quantity, as the annexed list of rewards given by Government during the last twelve months for their destruction will show. Those killed in Jeitpore are included, and I doubt not many have been brought away from the Independent Territory close by; but it proves the existence of a considerable number still in the neighbourhood. Leopards are occasionally brought in, and rumours of tigers are sometimes spread, but I have never heard of one being actually killed in the Pergunnah. In the year 1855 head money was paid for 16 leopards, 415 wolves, and 239 hyenas, amounting to Company's Rupees 1,781. Wild pigs find cover in the hills, and occasionally commit much damage to the cultivation. Antelope also are numerous, while the tanks and lakes furnish every species of wild fowl to the sportsman.

#### *Roads.*

The great road, leading from the Doab to Saugor, and Central India, passes through Mahoba; a branch from Humeerpore joins the main line from Banda at Kubrai, whence it traverses the Pergunnah till it crosses the Oormul Nuddee into the Chutterpore territory at Kaimaha; at Sreenugger it turns off to the cantonments at Nowgong; and from Mahoba Proper there are also roads to Soopa, Chirkharee and Bareegurh, which are annually repaired. When His Honor the Lieutenant Governor was at Banda last year, it was proposed that the road from thence to Nowgong should be metalled and the matter is now under consideration. I have therefore drawn up a tabular statement of the traffic which passed along it last year (Appendix No. II.) from monthly returns of the road chowkies at Jhur Kaimaha, from which the number of each species of conveyance can be seen at a glance. The returns from the East-

ward are probably correct enough, but as the Nowgong road turns off before reaching Kaimaha, those from the Westward omit all the traffic to and from the cantonments and their neighbourhood.

The road in question is a most important one, but is never in good order, except just after the annual repairs; it is much intersected with "nullahs," and in the rains is quite impassable; that it would be an expensive undertaking I believe, but as it passes through very little *mar* soil, and *kunkur* is to be met with along its course, I do not think it would be so much so, as most other lines of communication in Bundelcund, while in importance it yields to none.

### *Trade.*

From the abovementioned statements, it appears that the chief exports from Mahoba towards the East are pawn, cotton and ghee, in return for which are received grain of all kinds, sugar and cloth; while from the West, iron and kodo are imported in exchange for cotton. Grain, gram, tobacco, sugar and cloth, likewise pass in large quantities towards Chutterpore, from whence pawn, soap, ghee, salt, saltpetre, and iron are furnished for Banda and Humeerpore consumption.

### *Markets.*

Markets here seem only to be held in five or six of the larger villages, and in them but once a week; Kubrai alone having two market days, Saturday and Tuesday. In Mahoba Proper, on Saturday, and in Sreenugger, on Monday, there is a fair show of goods, and local bazars are held at Bareegurh and Bilbai on Fridays. Several Melas assemble in the year at different holy places of resort, but they are all for religious and not for commercial purposes.

### *Towns.*

The three residences of the Amils and Talookas of former days are naturally still the places of most consequence in the Pergunnah, and those containing the largest number of inhabitants. Mahoba itself with the adjacent villages of Dhureeba and Bhuttepura has a population of 7,846, and is the head-quarters of an Assistant Magistrate and his office. The Tehsildaree and Thanah are also here.

The numerous ruins of temples and dwellings, built of curiously cut granite, attest the greatness and wealth of its kings in former days; but long after their decay, it was made a place of importance by a large colony of "Brinjarees" or grain merchants settling here. They created as it were a new village to the East of the old town, erecting substantial stone houses, many of which are still in such good order as to show how recent their occupation was. There is nothing wonderful in their choosing this spot, situated as it is on one of the great roads to Central India, as the centre of their operations; but their sudden disappearance from the scene cannot fail to create surprise. Mr. Balfour, however, writing of these people in the Asiatic Society's Journal for January, 1844, gives a reason, which may in this matter be accepted as the true explanation. He states that they originally came from Rajpootana, carrying on traffic as grain merchants by laden bullocks, welcome everywhere in seasons of scarcity, supplying armies in war, and respected by both parties, each being equally interested in their safety. A time of hostility or dearth was a period of activity to them, and they rejoiced in the troublous times that enabled them, and them alone, to accumulate wealth in safety; but our success restored peace to India; the troops remain quiet in cantonments, cultivation is uninterrupted, and the occupation of the Brinjarees gone. When disease swept away their bullocks, the community being too impoverished to purchase others, broke up and dispersed.

Sreenuggur is chiefly known as the Mint from which issued the Sreenuggur Rupees, the general, and until the last settlement, the exclusive currency throughout this part of Bundelcund. Previously the Government Revenue was paid in the local coin, but since this has been forbidden, the circulation of the Company's Rupees has gradually increased, and in many villages they have become the medium of account. The town itself contains 5,447 inhabitants, is overlooked by the remains of a Fort now in ruins, and is the residence of several of the few monied men in the Pergunnah.

Kubrai has nothing remarkable about it, save as possessing a large market. The village in itself is not very large but Bughwa, Gouharee and Morheepoora, which with it form one town, raise its population to 4,032 souls.



*Population.*

The census of the Pergunnah made in the autumn of 1855 gives the following return—

| Men.   | Women. | Boys.  | Girls. | Total. |
|--------|--------|--------|--------|--------|
| 22,626 | 20,347 | 13,267 | 9,147  | 65,387 |

spread over ninety-one villages, of which the three above described are the largest. Besides them, but three, Jeouraha, Baregurh and Bilbai, have above 2,000, and nine others above 1,000 inhabitants.

The recency of the previous census renders any comparison with it useless, and none of earlier date appear to have been made. This is the more to be regretted, as in some villages the disproportion between males and females, especially among the children, is so great as to raise doubts whether infanticide is not yet more common here than is believed to be the case, and I have therefore added the statement in Appendix No. III., and have included in it the different classes of zemindars who own the villages.

*Castes.*

There are men of all castes to be found in the Pergunnah, but the greater number are naturally Rajpoots of different races, the most frequent perhaps being the Beis Thakoors, who especially abound to the North. Oorwara, a large village to the South-west, is the only one where a large brotherhood of Chandels still remain.

*Education.*

Education here is at a low ebb, in many villages, the Putwaree is the only scholar ; but this throughout Bundelcund is too commonly the case. In Oorwara, Sijharee, Sreenuggur, Puhra, and Mukurbai, however, the children of the kaieths, bunyas, bráhmans, and thakoors, read at home, and learn the rudiments of Hindee and accounts. Chikehra boasts a school at Pershad Tewaree's, as does Kubrai. Mahoba has two; from ten to fifteen boys attend, paying from three to four annas a month each. Besides this, wandering teachers at times visit the large villages and remain as long as the zemindars support them, in return imparting such instruction to the children as they are able.

## APPENDIX No. I.

Comparative table, shewing the amount of land in survey Beegahs under the different kinds of crops of the principal species.

| <i>Khareef or Summer Crop.</i> |        | <i>Rubbee or Winter Crop.</i> |        |
|--------------------------------|--------|-------------------------------|--------|
| Jowar, .....                   | 46,526 | Wheat, .....                  | 44,701 |
| Cotton, .....                  | 38,959 | Pulse (Nukhúd), .....         | 9,934  |
| Kodo, .....                    | 23,436 | Barley, .....                 | 7,729  |
| Sesame, .....                  | 23,153 | Al, .....                     | 4,478  |
| Sugar, .....                   | 1,916  | Linseed, .....                | 1,269  |
| Bájra, .....                   | 1,769  | Vegetables and other          |        |
| Sámah, .....                   | 840    | garden produce, ....          | 271    |
| Indigo, ....                   | 570    | Pawn, .....                   | 164    |
| Vetch (Másh), .....            | 351    | Tobacco, .....                | 138    |
| Rice, .....                    | 270    | Pulse (Munsoor), .....        | 104    |
| Kákoon, .....                  | 192    | Safflower, .....              | 96     |
| Vegetables and other           |        | Urhur (Pulse), .....          | 68     |
| garden produce, ....           | 190    |                               |        |
| Hemp, .....                    | 184    |                               |        |
| Tobacco, .....                 | 150    |                               |        |
| Pawn, .....                    | 25     |                               |        |

## APPENDIX No. II.

*Traffic and Exports from Mahoba towards the Eastward, or Humeerpore and Banda.*

|                  | Upland.       | Wheat.    | Barley.  | Bayra.   | Jowar.   | Gram.    | Rice.    | Tillic.      | Kodo.     | Dhal of sorts. | Soap.     | Tobacco. | Fruit and veg-<br>tables. | Molwa and Wine. | Pawn.      | Cotton and Cot-<br>ton seed. | Peclary, &c. | Gauja, Bhung, &c. | Ghee.      | Leather.   | Salt and Saltpetre. | Iron.      | Spice.     | Sugar and Saccha-<br>rine produce. | Cloth.    | Household stuff. | With men.    | Miscellaneous. | Total.        |
|------------------|---------------|-----------|----------|----------|----------|----------|----------|--------------|-----------|----------------|-----------|----------|---------------------------|-----------------|------------|------------------------------|--------------|-------------------|------------|------------|---------------------|------------|------------|------------------------------------|-----------|------------------|--------------|----------------|---------------|
| Carts, .....     | 6,629         | 3         | 5        | 0        | 0        | 8        | 0        | 909          | 1         | 0              | 36        | 4        | 214                       | 72              | 121        | 3,365                        | 0            | 2                 | 75         | 37         | 45                  | 293        | 6          | 75                                 | 2         | 125              | 1,019        | 154            | 13,193        |
| Covered ditto,   | 2             | 0         | 0        | 0        | 0        | 0        | 0        | 0            | 0         | 0              | 0         | 0        | 0                         | 0               | 0          | 0                            | 0            | 0                 | 0          | 0          | 0                   | 0          | 0          | 0                                  | 0         | 0                | 160          | 0              | 162           |
| Bullocks, .....  | 8,916         | 1         | 0        | 0        | 0        | 0        | 0        | 810          | 4         | 15             | 27        | 2        | 450                       | 24              | 2          | 328                          | 5            | 3                 | 261        | 25         | 7,131               | 585        | 91         | 4                                  | 12        | 245              | 0            | 107            | 19,394        |
| Buffaloes, ...   | 233           | 9         | 0        | 0        | 0        | 0        | 0        | 230          | 4         | 1              | 0         | 0        | 28                        | 2               | 95         | 3                            | 0            | 2                 | 27         | 1          | 27                  | 90         | 0          | 0                                  | 0         | 0                | 0            | 4              | 758           |
| Ponies, .....    | 155           | 0         | 0        | 0        | 0        | 0        | 0        | 5            | 3         | 2              | 4         | 0        | 8                         | 0               | 67         | 0                            | 65           | 0                 | 155        | 53         | 13                  | 3          | 31         | 3                                  | 14        | 89               | 8,511        | 88             | 9,232         |
| Camels, .....    | 82            | 11        | 0        | 0        | 0        | 0        | 0        | 0            | 0         | 0              | 15        | 0        | 6                         | 0               | 3          | 0                            | 9            | 1                 | 0          | 0          | 0                   | 0          | 3          | 0                                  | 4         | 69               | 24           | 10             | 237           |
| Asses, .....     | 45            | 0         | 0        | 0        | 0        | 0        | 0        | 0            | 0         | 0              | 0         | 0        | 0                         | 0               | 3          | 0                            | 0            | 0                 | 0          | 0          | 0                   | 0          | 0          | 0                                  | 0         | 1                | 0            | 0              | 49            |
| <b>Total, ..</b> | <b>16,052</b> | <b>24</b> | <b>5</b> | <b>0</b> | <b>0</b> | <b>8</b> | <b>0</b> | <b>1,954</b> | <b>12</b> | <b>18</b>      | <b>82</b> | <b>6</b> | <b>706</b>                | <b>98</b>       | <b>291</b> | <b>3,696</b>                 | <b>79</b>    | <b>8</b>          | <b>521</b> | <b>116</b> | <b>7,519</b>        | <b>971</b> | <b>131</b> | <b>82</b>                          | <b>32</b> | <b>529</b>       | <b>9,717</b> | <b>363</b>     | <b>13,023</b> |

*Traffic and Exports from Mahoba to the Westward or Chutterpore.*

|                   |               |              |            |           |           |              |           |            |          |            |          |            |           |          |          |            |           |          |          |          |           |          |           |               |            |            |              |            |               |
|-------------------|---------------|--------------|------------|-----------|-----------|--------------|-----------|------------|----------|------------|----------|------------|-----------|----------|----------|------------|-----------|----------|----------|----------|-----------|----------|-----------|---------------|------------|------------|--------------|------------|---------------|
| Carts, .....      | 1,979         | 1,678        | 58         | 14        | 14        | 167          | 15        | 4          | 2        | 73         | 1        | 91         | 26        | 0        | 0        | 76         | 1         | 3        | 0        | 0        | 15        | 2        | 2         | 77            | 32         | 25         | 1,884        | 69         | 6,394         |
| Covered ditto,    | 34            | 0            | 0          | 0         | 0         | 0            | 0         | 0          | 0        | 0          | 0        | 0          | 0         | 0        | 0        | 0          | 0         | 0        | 0        | 0        | 0         | 0        | 0         | 0             | 0          | 1          | 191          | 0          | 224           |
| Bullocks, .....   | 5,191         | 4,765        | 358        | 7         | 24        | 1,179        | 16        | 453        | 0        | 86         | 0        | 140        | 21        | 0        | 0        | 679        | 5         | 0        | 0        | 0        | 77        | 0        | 14        | 13,338        | 144        | 186        | 0            | 50         | 27,036        |
| Buffaloes, ...    | 151           | 11           | 12         | 0         | 4         | 29           | 0         | 1          | 1        | 0          | 0        | 1          | 12        | 0        | 0        | 0          | 0         | 0        | 0        | 2        | 0         | 0        | 2         | 19            | 14         | 6          | 0            | 2          | 254           |
| Ponies, .....     | 12,931        | 13           | 2          | 0         | 1         | 7            | 2         | 6          | 0        | 2          | 0        | 15         | 3         | 1        | 0        | 31         | 11        | 0        | 0        | 0        | 9         | 1        | 1         | 18            | 252        | 18         | 0            | 76         | 13,140        |
| Camels, .....     | 183           | 25           | 0          | 0         | 0         | 0            | 0         | 0          | 0        | 0          | 0        | 4          | 0         | 0        | 0        | 0          | 2         | 0        | 0        | 0        | 0         | 0        | 0         | 0             | 61         | 37         | 6            | 2          | 324           |
| Asses, .....      | 155           | 14           | 0          | 0         | 0         | 187          | 0         | 0          | 1        | 0          | 0        | 0          | 0         | 0        | 0        | 0          | 0         | 0        | 0        | 0        | 0         | 0        | 0         | 0             | 0          | 47         | 0            | 0          | 401           |
| <b>Total, ...</b> | <b>20,627</b> | <b>6,506</b> | <b>430</b> | <b>21</b> | <b>43</b> | <b>1,560</b> | <b>33</b> | <b>464</b> | <b>4</b> | <b>161</b> | <b>1</b> | <b>531</b> | <b>62</b> | <b>1</b> | <b>0</b> | <b>786</b> | <b>19</b> | <b>3</b> | <b>0</b> | <b>0</b> | <b>93</b> | <b>3</b> | <b>19</b> | <b>13,452</b> | <b>506</b> | <b>350</b> | <b>2,081</b> | <b>199</b> | <b>41,987</b> |

*Traffic and Imports into Pergunnah Mahoba from the Eastward, or Humeerpore and Banda.*

|                   |              |               |            |            |            |              |            |           |          |            |          |            |           |           |          |          |           |          |          |            |           |          |            |              |            |            |              |            |               |
|-------------------|--------------|---------------|------------|------------|------------|--------------|------------|-----------|----------|------------|----------|------------|-----------|-----------|----------|----------|-----------|----------|----------|------------|-----------|----------|------------|--------------|------------|------------|--------------|------------|---------------|
| Carts, .....      | 2,821        | 7,711         | 116        | 152        | 31         | 818          | 202        | 0         | 0        | 188        | 0        | 228        | 59        | 63        | 0        | 6        | 1         | 5        | 0        | 82         | 31        | 4        | 35         | 247          | 106        | 321        | 769          | 110        | 14,192        |
| Covered ditto,    | 4            | 0             | 0          | 0          | 0          | 0            | 0          | 12        | 0        | 0          | 0        | 0          | 0         | 0         | 0        | 0        | 0         | 0        | 0        | 0          | 0         | 0        | 0          | 0            | 0          | 0          | 191          | 0          | 198           |
| Bullocks, .....   | 3,335        | 9,356         | 97         | 259        | 86         | 1,056        | 109        | 0         | 0        | 158        | 0        | 619        | 20        | 26        | 0        | 0        | 0         | 0        | 0        | 77         | 61        | 0        | 90         | 1,196        | 588        | 18         | 0            | 65         | 17,258        |
| Buffaloes, ...    | 185          | 1,078         | 28         | 11         | 0          | 561          | 95         | 0         | 0        | 69         | 0        | 0          | 4         | 0         | 0        | 1        | 0         | 0        | 7        | 38         | 2         | 0        | 6          | 2            | 0          | 2          | 0            | 8          | 2,097         |
| Ponies, .....     | 191          | 58            | 0          | 0          | 0          | 8            | 2          | 0         | 0        | 4          | 0        | 8          | 3         | 0         | 0        | 0        | 70        | 1        | 0        | 180        | 2         | 0        | 18         | 13           | 99         | 117        | 7,396        | 71         | 8,214         |
| Camels, .....     | 70           | 0             | 1          | 0          | 0          | 0            | 1          | 0         | 0        | 0          | 0        | 5          | 1         | 0         | 0        | 0        | 5         | 0        | 0        | 0          | 0         | 0        | 2          | 0            | 82         | 105        | 32           | 2          | 306           |
| Asses, .....      | 144          | 156           | 0          | 0          | 0          | 10           | 2          | 0         | 0        | 0          | 0        | 0          | 0         | 0         | 0        | 0        | 0         | 0        | 0        | 4          | 0         | 0        | 0          | 0            | 4          | 0          | 0            | 0          | 320           |
| <b>Total, ...</b> | <b>6,753</b> | <b>18,359</b> | <b>272</b> | <b>422</b> | <b>120</b> | <b>2,153</b> | <b>411</b> | <b>12</b> | <b>0</b> | <b>419</b> | <b>0</b> | <b>890</b> | <b>87</b> | <b>89</b> | <b>0</b> | <b>7</b> | <b>76</b> | <b>6</b> | <b>7</b> | <b>381</b> | <b>96</b> | <b>4</b> | <b>151</b> | <b>1,458</b> | <b>879</b> | <b>563</b> | <b>8,391</b> | <b>259</b> | <b>44,215</b> |

*Traffic and Imports into Mahoba from the Westward or Chutterpore.*

|                   |               |            |           |          |           |           |           |            |           |           |           |          |            |           |            |           |           |           |            |           |              |              |           |          |            |            |              |            |               |
|-------------------|---------------|------------|-----------|----------|-----------|-----------|-----------|------------|-----------|-----------|-----------|----------|------------|-----------|------------|-----------|-----------|-----------|------------|-----------|--------------|--------------|-----------|----------|------------|------------|--------------|------------|---------------|
| Carts, .....      | 2,928         | 2          | 5         | 0        | 3         | 2         | 0         | 198        | 8         | 6         | 27        | 0        | 30         | 1         | 26         | 21        | 1         | 13        | 13         | 13        | 35           | 301          | 13        | 2        | 3          | 15         | 1,851        | 116        | 5,556         |
| Covered ditto,    | 20            | 0          | 0         | 0        | 0         | 0         | 0         | 0          | 0         | 0         | 0         | 0        | 0          | 0         | 0          | 0         | 0         | 0         | 0          | 0         | 0            | 0            | 0         | 0        | 0          | 1          | 168          | 0          | 187           |
| Bullocks, .....   | 9,509         | 363        | 14        | 0        | 12        | 12        | 93        | 263        | 32        | 7         | 18        | 1        | 76         | 54        | 2          | 0         | 6         | 3         | 177        | 0         | 5,689        | 2,091        | 3         | 2        | 30         | 110        | 0            | 103        | 18,670        |
| Buffaloes, ...    | 60            | 1          | 3         | 0        | 0         | 0         | 3         | 30         | 3         | 1         | 0         | 0        | 1          | 1         | 1          | 0         | 0         | 0         | 2          | 3         | 8            | 63           | 3         | 0        | 0          | 13         | 0            | 22         | 218           |
| Ponies, .....     | 15,845        | 0          | 2         | 0        | 3         | 1         | 0         | 4          | 7         | 1         | 14        | 1        | 8          | 8         | 110        | 8         | 19        | 1         | 27         | 0         | 11           | 14           | 6         | 3        | 166        | 22         | 0            | 32         | 16,306        |
| Camels, .....     | 116           | 0          | 0         | 0        | 0         | 0         | 0         | 2          | 0         | 0         | 1         | 0        | 0          | 0         | 7          | 0         | 0         | 1         | 0          | 0         | 0            | 9            | 0         | 0        | 4          | 41         | 11           | 34         | 230           |
| Asses, .....      | 280           | 0          | 0         | 0        | 0         | 0         | 0         | 0          | 0         | 0         | 0         | 0        | 0          | 0         | 0          | 0         | 0         | 0         | 0          | 0         | 2            | 0            | 0         | 2        | 26         | 0          | 4            | 0          | 314           |
| <b>Total, ...</b> | <b>28,758</b> | <b>366</b> | <b>24</b> | <b>0</b> | <b>18</b> | <b>15</b> | <b>96</b> | <b>407</b> | <b>50</b> | <b>18</b> | <b>50</b> | <b>2</b> | <b>115</b> | <b>64</b> | <b>146</b> | <b>29</b> | <b>26</b> | <b>18</b> | <b>229</b> | <b>16</b> | <b>5,733</b> | <b>2,490</b> | <b>23</b> | <b>7</b> | <b>205</b> | <b>228</b> | <b>2,031</b> | <b>315</b> | <b>41,481</b> |

(Signed) G. H. FREELING,  
Settlement Officer.



## APPENDIX No. III.

*Population and Castes of the owners in the Villages of the Pergunnah Mahoba.*

| Villages.             | Caste.                              | Men. | Women.       | Boys. | Girls. | Total. |
|-----------------------|-------------------------------------|------|--------------|-------|--------|--------|
| Utrar, .....          | Nudwanee Takoor, ...                | 315  | 312          | 188   | 139    | 954    |
| Unulhai, .....        | Beis Takoor, .....                  | 0    | 0            | 0     | 0      | 0      |
| Imilya, .....         | Ahirs, .....                        | 53   | 56           | 48    | 31     | 188    |
| Ootiya, .....         | Pomar Takoor, .....                 | 414  | 343          | 183   | 125    | 1,065  |
| Oorwara, .....        | Chundels and Parihar Takoor, ...    | 310  | 307          | 191   | 140    | 948    |
| Bareegurh, .....      | Banafer Takoor, .....               | 807  | 729          | 508   | 459    | 2,503  |
| Budoura, .....        | Brahmin, .....                      | 494  | 351          | 474   | 199    | 1,518  |
| Bura Oobaree, .....   | Lodhee, .....                       | 262  | 223          | 153   | 46     | 684    |
| Buraipoora, .....     | Khatree, .....                      | 26   | 25           | 13    | 23     | 87     |
| Busoura, .....        | Lodhee, .....                       | 122  | 105          | 67    | 46     | 340    |
| Bughwa, .....         | Beis Takoor, .....                  | 251  | 192          | 89    | 55     | 587    |
| Bilbai, .....         | Lodhee, .....                       | 854  | 739          | 399   | 307    | 2,299  |
| Bilrahee Oobaree, ... | Parihar Takoor, .....               | 149  | 126          | 89    | 55     | 419    |
| Bilkhee, .....        | Brahmin and Lodhee, ..              | 160  | 188          | 198   | 103    | 649    |
| Bumhouriya, .....     | Gosaien, .....                      | 53   | 43           | 42    | 30     | 168    |
| Bumhouree Purgas, ..  | Banafer Takoor, .....               | 594  | 524          | 388   | 239    | 1,745  |
| Bumhouree Kugu, ..    | Beis Takoor, .....                  | 247  | 181          | 84    | 32     | 544    |
| Buniya Tala, .....    | Brahmin and Lodhee, ..              | 81   | 78           | 63    | 42     | 264    |
| Bhuteor, .....        | Beis Takoor, .....                  | 70   | 52           | 46    | 16     | 184    |
| Bhundra, .....        | Brahmin, .....                      | 301  | 247          | 236   | 141    | 925    |
| Bhuteepoora, .....    | Mahomedan, .....                    | 534  | 547          | 321   | 281    | 1,683  |
| Beejunuggur, .....    | Banafer and Brahmin, ..             | 34   | 29           | 20    | 10     | 93     |
| Beela, .....          | Beis Takoor, .....                  | 239  | 219          | 170   | 112    | 740    |
| Bela, .....           | Marwaree, .....                     | 57   | 46           | 23    | 25     | 151    |
| Puchpuhra, .....      | Lodhee and Boondela, ..             | 100  | 87           | 70    | 63     | 320    |
| Puchuhra, .....       | Banafer Takoor, .....               | 72   | 67           | 59    | 44     | 242    |
| Puswara, .....        | Ditto and Lodhee, ...               | 367  | 299          | 146   | 123    | 935    |
| Pulka, .....          | Boondela, .....                     | 107  | 88           | 62    | 53     | 310    |
| Powa, .....           | Lodhee, .....                       | 539  | 553          | 300   | 248    | 1,640  |
| Puhra, .....          | Mahar Takoor, .....                 | 620  | 607          | 336   | 209    | 1,772  |
| Tindowlee, .....      | Lodhee, .....                       | 136  | 112          | 67    | 41     | 356    |
| Thanah, .....         | Banafer, .....                      | 81   | 64           | 34    | 33     | 212    |
| Tikree, .....         | Banafer, .....                      | 227  | 195          | 151   | 95     | 668    |
| Tontiya Bara, .....   | Brahmin, .....                      | 1    | 1            | 0     | 0      | 2      |
| Teekamow, .....       | Koormee and Sunoreea Brahmin, ..... | 180  | 140          | 114   | 74     | 508    |
| Joojhar, .....        | Lodhee, .....                       | 64   | 51           | 36    | 25     | 176    |
| Jeoraha, .....        | Banafer Takoor, ...                 | 774  | 659          | 428   | 283    | 2,144  |
| Jhursuhewa, .....     | Kachee, .....                       | 54   | 34           | 33    | 35     | 176    |
| Chando, .....         | Lodhee, .....                       | 32   | 29           | 29    | 17     | 107    |
| Chitaiya, .....       | Ahir, .....                         | 40   | 40           | 29    | 9      | 118    |
| Chukmurela, .....     | Beis and Banafer, ...               | 0    | 0            | 0     | 0      | 0      |
| Chundpoora, .....     | Lodhee, .....                       | 85   | 73           | 63    | 42     | 263    |
| Choorbura, .....      | Lodhee, .....                       | 75   | 68           | 52    | 19     | 214    |
| Chhikehra, .....      | Lodhee, .....                       | 626  | 571          | 384   | 321    | 1,902  |
| Dureeba, .....        | Burrai, .....                       |      | with Mahoba. |       |        |        |
| Dumowra, .....        | Banafer Takoor, .....               | 100  | 84           | 55    | 63     | 302    |
| Didwara, .....        | Ahir and Googen, ...                | 327  | 311          | 187   | 129    | 954    |
| Dhoondhut, .....      | Goosaien, .....                     | 172  | 138          | 88    | 75     | 473    |

*Population and Castes of the owners in the Villages of the Pergunnah Mahoba.—Continued.*

| Villages.                | Caste.                  | Men.   | Women. | Boys.  | Girls. | Total. |
|--------------------------|-------------------------|--------|--------|--------|--------|--------|
| Dighuriya, .....         | Kachee, .....           | 51     | 75     | 84     | 47     | 257    |
| Duhura, .....            | Beis Takoor, .....      | 352    | 309    | 191    | 116    | 968    |
| Dhikwaha, .....          | Takoors, .....          | 93     | 85     | 69     | 43     | 290    |
| Dhoondaiya, ..           | Brahmin, .....          | 52     | 46     | 31     | 20     | 149    |
| Rutonlee, .....          | Beis and Banafer, ...   | 325    | 247    | 162    | 73     | 807    |
| Ruhiliya, .....          | Brahmin & Lodhee, ...   | 59     | 52     | 53     | 42     | 206    |
| Raepoora Khoord, ...     | Takoors, .....          | 67     | 59     | 49     | 19     | 194    |
| Raepoora Kullán, ...     | Kangar, .....           | 53     | 58     | 45     | 32     | 188    |
| Raiwara, .....           | Bugree and Mahar        |        |        |        |        |        |
|                          | Takoor, .....           | 155    | 137    | 65     | 48     | 405    |
| Sijuriya, .....          | Lodhee, .....           | 88     | 122    | 115    | 66     | 391    |
| Sijwaha, .....           | Ditto, .....            | 158    | 151    | 103    | 65     | 477    |
| Sijharee, .....          | Ditto, .....            | 581    | 489    | 246    | 240    | 1,557  |
| Sreenuggur, .....        | Brahmin and Lodhee, ... | 1,868  | 1,830  | 999    | 750    | 5,447  |
| Sookoura, .....          | Brahmin & Rajpoot, ...  | 151    | 106    | 68     | 41     | 366    |
| Sularpoor, .....         | Lodhee, .....           | 203    | 186    | 99     | 88     | 576    |
| Shahpuharee, .....       | Lodhee, .....           | 127    | 116    | 77     | 45     | 365    |
| Shumshera Photera, ...   | Brahmin, .....          | 11     | 9      | 8      | 3      | 31     |
| Futtehpoore, .....       | Mahomedan, .....        | 0      | 0      | 0      | 0      | 0      |
| Karee Puharee, .....     | Brahmin & Lodhee, ...   | 275    | 146    | 136    | 105    | 662    |
| Kubrai, .....            | Beis Takoor, .....      | 1,001  | 825    | 459    | 295    | 2,580  |
| Kiraree, .....           | Lodhee, .....           | 51     | 32     | 28     | 12     | 123    |
| Kuruhree, .....          | Beis and Banafer, ...   | 18     | 15     | 13     | 8      | 54     |
| Koomhroua, .....         | Boondela, .....         | 145    | 164    | 128    | 84     | 521    |
| Kaimaha, .....           | Chundel, .....          | 80     | 74     | 51     | 32     | 237    |
| Khurka, .....            | Bugree Kukoor, .....    | 328    | 306    | 153    | 122    | 909    |
| Khooreree, .....         | Parihar Takoor, .....   | 175    | 142    | 94     | 92     | 503    |
| Kheoraiya, Jeoraiya, ... | Boondela, .....         | 104    | 113    | 111    | 73     | 401    |
| Gunj, .....              | Brahmin, .....          | 367    | 298    | 169    | 122    | 956    |
| Goopalpoor, .....        | Ditto, .....            | 0      | 0      | 0      | 0      | 0      |
| Googoura, .....          | Beis Takoor, .....      | 159    | 126    | 87     | 74     | 446    |
| Gouharee, .....          | Ditto, .....            | 125    | 126    | 65     | 19     | 335    |
| Ghutuhree, .....         | Brahmin, .....          | 107    | 98     | 85     | 37     | 327    |
| Ghootwai, .....          | Banafer & Brahmin, ...  | 33     | 30     | 30     | 15     | 108    |
| Ghoojoura, .....         | Banafer Takoor, .....   | 21     | 17     | 13     | 2      | 53     |
| Mamna, .....             | Lodhee, .....           | 86     | 83     | 51     | 57     | 277    |
| Mujhuhwara, .....        | Ditto, .....            | 256    | 262    | 35     | 111    | 664    |
| Mirtula, .....           | Ditto, .....            | 60     | 51     | 37     | 29     | 177    |
| Makurbai, .....          | Beis Takoor, .....      | 534    | 449    | 353    | 131    | 1,467  |
| Moodhura Khoord, ...     | Lodhee, .....           | 104    | 84     | 84     | 57     | 329    |
| Moodhura Kullán, ...     | Takoors, .....          | 600    | 490    | 233    | 156    | 1,479  |
| Mooranee, .....          | Lodhee, .....           | 48     | 34     | 26     | 28     | 136    |
| Mocheepoora, .....       | Brahmin, .....          | 184    | 168    | 111    | 67     | 530    |
| Muwai, .....             | Komar Takoor, .....     | 83     | 77     | 65     | 60     | 285    |
| Mahoba, .....            | Mahomedan and Ka-       |        |        |        |        |        |
|                          | chee, .....             | 1,932  | 1,965  | 1,344  | 922    | 6,163  |
| Nothoopoora, .....       | Lodhee, .....           | 25     | 31     | 26     | 15     | 97     |
| Nuhdoura, .....          | Brahmin, .....          | 48     | 38     | 32     | 17     | 135    |
| Naigoan, .....           | Beis Takoor, .....      | 77     | 81     | 58     | 12     | 228    |
| Hurdooah Bulkora, ...    | Bugree and Mohar        |        |        |        |        |        |
|                          | Takoor, .....           | 0      | 0      | 0      | 0      | 0      |
| Total,...                |                         | 22,626 | 20,347 | 13,267 | 9,147  | 65,387 |

PROCEEDINGS  
OF THE  
ASIATIC SOCIETY OF BENGAL,

FOR SEPTEMBER, 1859.

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The Monthly General Meeting of the Asiatic Society was held on the 7th instant.

A. GROTE, Esq., President, in the Chair.

The Proceedings of the last meeting were read and confirmed. Presentations were received—

1. From the Principal, Grant Medical College, Bombay, a copy of the Report of that Institution for the Session 1858-59.

2. From the Bombay Government, a copy of the Annual Report on the Sind Forests, for the year 1858-59.

3. From Captain Hodge, in command of the *Sesostris* guard ship, at Port Blair. Numerous specimens illustrative of the Zoology of the Andaman Islands.

4. From Captain Eales, commanding the *Fire Queen*, an example of the gigantic cobra (*Hamadryas vittatus*), also from Port Blair.

5. From Babu Rajendra Mallika. A dead Orang-utan.

6. From Major S. R. Tickell, Maulmein, skins of a rare squirrel and of a white-headed *Halcyon*.

7. From Captain Jethro Fairweather. Skull of a Dolphin, taken in the Bay of Bengal.

8. From Major R. C. Tytler, another skull of a Dolphin, taken westward of the Cape of Good Hope.

The following gentlemen duly proposed at the last meeting were ballotted for and elected ordinary members :—

Dr. A. Campbell, Darjeeling, (re-elected); Captain J. Sherwill, Revenue Survey, Dinajpore; Captain H. Hopkinson, Commissioner, Tenasserim Provinces re-elected; A. E. Russell, Esq., c. s.; W. L. Wilson, Esq.; the Rev. F. F. Mazuchelli, D. D.; Major Seymour Blane; J. Geoghegan, Esq., c. s.; Dr. E. Goodeve; Major Douglas, Professor of Natural Philosophy and Astronomy, Presidency College (re-elected); R. Jones, Esq., Professor of Moral and Mental Philosophy, Presidency College (re-elected); David M. Gardner, Esq., c. s.

The following gentlemen were named for ballot as ordinary members at the next meeting:—

Dr. C. Archer, proposed by the Ven'ble Archdeacon Pratt and seconded by Mr. G. Loch.

Captain J. C. Haughton, Superintendent of Port Blair, proposed (for re-election) by Mr. Atkinson and seconded by Dr. Thomson.

Augustus Fisher, Esq. proposed by Mr. J. G. Medlicott and seconded by Mr. H. Scott Smith.

Dr. G. K. Hardie, proposed by Mr. J. G. Medlicott and seconded by the President.

Lewin Bentham Bowring, Esq. c. s., proposed for re-election by Mr. Atkinson and seconded by the President.

D. Fitzpatrick, Esq. c. s., proposed by Mr. Beaufort and seconded by Mr. Atkinson.

Captain Forlong, Madras Army, Moulmein, proposed by Dr. Fayer and seconded by Mr. Medlicott.

The Council reported that they had addressed the following letter to the Secretary of State for India, with the documents annexed, on the subject of the foundation of an Imperial Museum in Calcutta:—

*To the Right Hon'ble the Secretary of State for India.*

RIGHT HON'BLE SIR,—I am directed by the Council of the Asiatic Society of Bengal to submit for your consideration the accompanying correspondence, which has passed between them and the Supreme Government of India relative to the establishment of an Imperial Museum in Calcutta, with documents attached, which appear requisite for the complete illustration of the subject.

The Council desire me to say that although they believe that the general plan sketched out in my first letter to the Government of



India is one which is eminently adapted in the present state of Science and Education in India, to promote the interests of both, yet that they are far from wishing it to be understood that their own is the only scheme to which they are willing to lend their aid. To advance the interests of Science in the most effectual way is their sole desire, and they will gladly assist in furthering any scheme which may appear better calculated to effect this great object, provided it be compatible with the trusts confided to their care.

The Council are fully aware that the pressure of financial difficulties at the present time must prevent the immediate adoption of any comprehensive plan involving a large outlay of money, but they desire to lay before you the facts of the case, and the arguments in favor of some such arrangements as they have proposed, believing that an expression of opinion on the part of Her Majesty's Secretary of State for India in favor of such a scheme would tend in no small measure to insure its ultimate success.

I have the honor to be, Sir,

Your most obedient servant,

(Sd.) W. S. ATKINSON,  
*Secy. Asiatic Society.*

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#### CORRESPONDENCE WITH THE GOVERNMENT OF INDIA.

*Asiatic Society's Rooms, Calcutta, dated 8th October, 1858.*

To C. BEADON, Esq.,

*Secy. to the Govt. of India, Home Dept.*

SIR,—I am instructed by the Council of the Asiatic Society of Bengal, to communicate to you, for submission to the Honorable the President in Council, that at a General meeting of the Society, held on the 6th May, 1857, the following resolution, based upon a report from the Committee of Natural History (of which a copy is annexed), was proposed by the Council for adoption by the Society, and was passed at a numerously attended meeting—

“ That the Council be authorized to enter into communication with the Government on the subject of the foundation at Calcutta

of an Imperial Museum, to which the whole of the Society's Collections, except the Library, might be transferred, provided the locality, the general arrangements, and management be declared, on a reference to the Society at large, to be perfectly satisfactory to its members."

2. The Council were on the point of soliciting the Government of India to take into its favourable consideration the subject of the resolution when the terrible events of the last year burst upon us. The time was obviously no longer suited for such discussions, and it became necessary to wait till the question could once more be approached with propriety. This, the Council venture to think, may now be done.

3. The Council of the Society, first desire gratefully to acknowledge the support which they have so long received from the Government; a support which has in all cases been accorded with liberality and frankness. At the same time they may express their conviction that the Society has not been found wanting on its own part. In the face of many difficulties, the Asiatic Society has, it is believed, continued to advance the cause of knowledge from the days of its illustrious founder to the present time. Large and important collections have been brought together and preserved by its means; and an unbroken series of publications has been maintained in its Researches and Journal, which may generally bear a favourable comparison with the records of the learned societies of Europe, and among the pages of which, may be found many most valuable contributions to Literature and Science.

4. The Council further have to express the high sense they entertain of the liberal and enlightened arrangements which have recently been adopted for the extension of education and the general advancement of knowledge in this country; and, speaking in the name of the oldest of the Literary and Scientific bodies in the East, they feel that they may beg to be heard on what they deem a most important element in all such arrangements, the foundation of a Public Museum on a comprehensive basis.

5. In addressing the Government on this subject, an explanation may seem due in regard to a former decision of the Society concerning its Geological collections, by which it may have appeared, in

some measure, to have failed in co-operating with the Government almost in the very matter on which it now claims assistance. This decision arose from a conviction, which, if mistaken, was certainly honorable and justifiable, that the separation of an important portion of the Society's collections would be injurious to its interest or even fatal to its existence; but the Resolution, which empowers the Council now to address the Government, sufficiently attests the opinions of the Society upon the present question.

6. In proceeding to explain more precisely the nature of their present proposal, the Council would remark how important it is that the efforts of all who are interested in the progress of the various branches of Natural Science in this city should be combined in one and the same direction. So long as our Collections are broken up into detached portions, we deprive them of half their value, because they do not afford to the Scientific investigator those means of comparison, which, from the intimate relations between the several Natural Sciences, are essential to complete and successful research. The interest of scientific enquiry and the means of useful study must be greatly diminished, if we lose the opportunity of tracing out the connections and relations between natural objects. A Museum, so far as it is practicable, should exhibit unbroken that series of links which actually exists in Nature. Cordially approving therefore, the expressed intention of the Government to form in connexion with their Colleges such Natural History or other collections as may be requisite for the purposes of instruction, the Council would most earnestly insist on the superior advantages which must result from the establishment of one Central and General Museum in which all our resources, (which on the most sanguine estimate certainly are not likely to be excessive,) should be concentrated. It is to solicit the Government to undertake the foundation of such a Museum in which all our available Natural History Collections might be combined, and in which should be provided a fitting place of exhibition for other objects of interest whether Physical, Economical, or Historical, that the Council has instructed me now to address you; and it is for the foundation of such a Museum that the Society is prepared, in the terms of its Resolution, to bestow the whole of its own collections.

7. The final acceptance of any terms, which the Government may see fit to offer, must, under the Resolution, rest with the Society at large, and it will not be necessary for the Council at present to enter into any detailed consideration of the arrangements that might, in their opinion, be best suited for such an Institution ; but it may be convenient if they explain generally the footing on which they think a Public Museum might be constituted in Calcutta.

8. The first question to be considered, is, that of locality. Such a Museum as is contemplated would probably, to say the least, be as much frequented by Europeans as by Natives. The majority of its visitors would not be the pupils of any scholastic institution. Those who would derive most benefit from it would be persons who, having acquired the first elements of knowledge elsewhere, would use the Museum and its adjuncts as aids in the further pursuit of their enquiries. The Museum, therefore, should be conveniently situated for all classes, and being itself a marked evidence of progress in civilization, it ought to find its abode in the best part of the city. The Council is of opinion that the Society's premises, which are its own property, afford a very suitable locality. The situation is one of the most desirable in Calcutta, and the fact that large numbers of Natives of all classes now visit the Society's collections, is evidence that it is not found inconvenient to the native population.

9. A Museum like that contemplated ought not to be viewed as a portion of any merely scholastic arrangements. Once classified, catalogued and arranged, the valuable specimens which would form the main series of such a public Museum, must not be removable, and more especially must not be subjected to the risk of breakage and loss which their use in the common class rooms would entail. From the many duplicates, however, which every such collection affords, a perfectly effective, though limited set of specimens in each department could readily be supplied for lecturing purposes. A Public Museum of the kind contemplated would form a most valuable and a most essential portion of all complete educational arrangements, but, in the opinion of the Council, it ought not to be made subordinate to any individual School or College. It should, they think, be viewed rather as an adjunct to the University, than as a part of any mere collegiate plan. It ought to be, as it were, the general library

of reference and consultation for all students of all schools, not the lending library of one alone.

10. And the Council would here venture to make a few remarks relative to the domicile of the University which they trust will not be thought inappropriate. The true and logical idea of a University will, they fear, run some risk of being lost, if it becomes liable to be identified even in appearance with one of its affiliated Colleges, by being domiciled under the same roof with it. At the same time, any College thus connected with the University would be raised to undue pre-eminence among its fellows. The Council think they are justified in this view by the history of the London University while temporarily housed in University College; and if this juxtaposition created a serious misconception of the distinct aims and position of each in Great Britain, where the public have been for centuries accustomed to Collegiate and University arrangements, it will be infinitely more likely to do so in India, where they are perfectly novel.

11. The Council are disposed to think, that the natural domicile of the University if it be housed with any other public body, should rather be with the Asiatic Society. The one body is charged with the serious and responsible task of testing the progress of the higher classes of the students of the country, and of rewarding the successful cultivation of Literature and Science. The other is a voluntary association of those, who being themselves devoted to the pursuit of knowledge, have combined for the encouragement of learning and the advancement of science. The Council believe that considerations of this kind materially influenced the arrangement that has been carried out in London, by which the London University is located with the Royal Society of London, and other Scientific Societies, in Burlington House.

12. The combination of the several departments of a national Museum, of the Halls of the University, and of the Meeting Rooms and Library of the Asiatic Society under one and the same roof, would therefore appear to the Council to be very natural and very desirable. They do not think it needful to urge at length the importance of the facility of reference thus afforded, or the value of the mutual assistance which each department of the Museum, and the Society itself, would derive from such an arrangement. These advantages are obvious.

13. Such a Museum would of course be freely open to the Public, (as that of the Asiatic Society now is) under suitable regulations.

14. With respect to management, if the suggestion above thrown out were adopted, and the University of Calcutta, the Asiatic Society of Bengal, and the National Museum, were combined under one roof, it might be thought that a board selected from among the members of the University, and of the Asiatic Society, would afford a practicable and effective control. A Board of some sort seems to be essential to provide an efficient general control over the various departments of which the Museum would consist, and to ensure steadiness of purpose and system ; and as the nucleus of the Museum would be the gift of the Asiatic Society, that body might have the power of selecting some of its own members to share in the management. Such an arrangement would probably remove objections to the proposed transfer entertained by some of our members, who think that the Society has no right to alienate collections, which they conceive to be held by it on trust.

15. As to the extent of the Museum, it must of course, be regulated by the funds that the Government might find itself in a position to set aside for such an object. A natural limit might readily be assigned to it by confining it specially to the preservation of objects collected in India with such small additions of a typical character as might be necessary for purposes of illustration.

16. But the Council will abstain from entering into details in respect of this, as of other matters, and they will only further add that in an economical point of view the combination of all the Natural History collections in one Museum, would appear advantageous not only as respects the staff of Curators, but as it might be made ancillary to the appointment of Professors of Natural Science, whose lectures would be accessible to all students, from all educational institutions, on terms of perfect equality.

17. The Council having thus briefly indicated the general nature of their proposal, desire to explain the causes which have more immediately led to the present application of the Society. With the gradual accumulation of their collections, it has at length become apparent that the funds of the Society are quite inadequate for the proper maintenance or display of the specimens. The collections are still in a satisfactory state of preservation, but the Council cannot

avoid looking forward to the day when they will sensibly begin to deteriorate, if precautions are not taken for their better preservation, which unfortunately are beyond the very limited means at the disposal of the Society.

18. From the want of space, and the restricted funds, the arrangement of the collections is also of necessity in a very imperfect condition; so much so, that the Museum of the Society, although it contains a most valuable collection of specimens of all descriptions, has little claim to be considered in the light of a scientific Institution.

19. The Council are convinced that from want of funds, present or prospective, the Society is powerless for good in this matter, and that the only step that can be taken to insure the preservation of these most valuable collections from eventual destruction, and to render them really useful in a scientific point of view, is to make their present proposal. They are aware that at the present time, financial considerations are likely to constrain the Government to pay the strictest attention to economy in dealing with this matter. But in the existing state of the Society, and of the collections, they feel that they can delay no longer in submitting the question for decision.

20. In conclusion, I am instructed again most respectfully but most earnestly to commend to the favourable consideration of the President in Council this important subject, I am to assure the Government that the Asiatic Society will approach the discussion of any details connected with it, into which they are prepared to enter in any manner that may be thought most suitable, with the warmest appreciation of the liberality with which the Society's efforts have always been seconded by the Government, and with the strongest sense of the enlightened views which have guided the Government of India in the cause of Education.

I have, &c.

(Signed) W. S. ATKINSON,

*Secretary to the Asiatic Society of Bengal.*

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#### REPORT OF THE COMMITTEE OF NATURAL HISTORY.

The Committee of Natural History having been directed by the Council of the Society to consider the condition of the Natural

History collections, their first care was to provide for matters of immediate necessity, and the recommendations which they made on these subjects have already met with the ready approval of the Society.

They now propose to enter more fully on the larger question of the future disposal of the Natural History collections generally.

The Committee have had several meetings, and have enquired carefully into the condition of the specimens, the accommodation available in the Society's house, and the efficiency of the Curator's staff.

The Zoological collections are very extensive and valuable, they have been found on the whole in a fair state of preservation, though they have certainly not received that amount of care of which they are deserving. The Society's collection of Indian Birds is believed to be the largest and most complete of any that exists in any Museum in the world, and the series of Quadrupeds is very rich.

The Committee would here beg to bring prominently to notice, as a result of their present investigations, that the generally satisfactory condition in which the specimens in the Museum have been found, notwithstanding the insufficient care which has been bestowed upon them, distinctly shows that the idea, believed to be prevalent, of the climate of Bengal being necessarily destructive to Natural History collections is altogether erroneous. Zoological specimens are undoubtedly perishable objects, but those precautions which will preserve them in the Cabinets of a European Museum, for precautions are every where necessary, will certainly be found equally efficacious in this country also. Any objections therefore to the maintenance of such collections, based upon the special difficulties of preserving them in the climate of Calcutta, must be held to be fallacious.

The Society's collection of Fossils is also very valuable, especially those of Tertiary age from the Sewalik range, Ava and Perim Island.

With reference to the House, we would observe that the interior arrangements are generally ill-adapted for the purposes of a Museum. The ground floor is particularly objectionable. The upper story alone can be considered available for the arrangement and exhibition



of the perishable collections, or for the location of the Library. The light is every where defective, especially on the ground floor. The space is already insufficient for the demands made upon it by the existing Museum, (including the Zoological and Geological collections and the Antiquities), by the Library and the Society's Meeting Room. The rooms on the upper floor are even now over-filled, and if a sufficient number of cases were set up for the proper display of the existing collections, the space would be blocked up in a most objectionable and inconvenient degree. The cabinets are now excessively crowded, many skins are put away, because there is no room for them to be set up, and no possible accommodation exists for any future increase to this part of the museum. The size and position of the available rooms is awkward, not permitting of the proper consecutive arrangement of the several groups of objects in each department, a point of altogether primary importance in illustration of those branches of knowledge which are emphatically termed Sciences of classification.

The establishment maintained for the care of the Zoological collections has of late years been quite insufficient to meet the demands made upon it for setting up new specimens and for watching or cleaning those already placed in the cabinets. The Mineralogical and Geological collections have lately been deprived of any special custodian, by the removal of the Government Museum of Economic Geology, and the withdrawal of the grant for many years made by the Government to the Society, for the purpose of paying a joint Curator for this department of the Museum. This part of the collections urgently requires re-arrangement, but it is not easy to see how it can be accomplished under existing circumstances. The Zoological Curator, Mr. Blyth, is confessedly incompetent to undertake the duty ; nor indeed, would it be reasonable to expect that any one man, should possess the requisite attainments in all branches of Natural Science, to superintend effectively the scientific arrangement or management of the whole Museum ; still less, that with such a salary as that of our present Curator, the services of a man of education can be retained, or his exclusive and entire attention secured to the duties of his office.

Under these circumstances, we have to inquire whether the funds at the disposal of the Society are sufficient to make those alterations in the Building which would make it suitable for the purposes of a Museum, and whether the Society can maintain such an establishment as shall ensure the satisfactory custody and arrangement of the specimens. The Committee is of opinion that the funds are quite inadequate to any such objects.

And first we have to remark that the entire available balance now in hand is less than 4000 Rs. But it is clear that the whole of this could not reasonably be expended on the Natural History Museum. The library might, with much advantage, have a large portion of this sum devoted to it, and the repair of the building which will be again required in less than two years, will absorb upwards of a thousand Rupees, for which prudence demands that a provision should be made beforehand.

Neither is the income of the Society sufficient to give any hope of such an addition being possible to the Curator's staff of assistants, as will provide efficient supervision of a scientific character. The sum placed at the disposal of the Society by the Government is quite inadequate to secure the services of even one properly qualified Curator and the means of the Society do not enable it to make good the deficiency. It need hardly be added that without proper Curators a Museum almost ceases to be a scientific institution.

On the whole, the Committee is convinced that the Asiatic Society is not capable of supporting a Natural History Museum on any but the most limited scale; and that, without a considerable addition to the Government grant now made, even the existing collections cannot be maintained. If things are left on their present footing a gradual deterioration must take place in the condition of the collections, and sooner or later they will pass from their present unsatisfactory state into one of entire ruin.

Any help which the Government is at all likely to proffer to the Society would certainly be inadequate to provide for any future extension of the Museum, and unless some entire change of organization takes place, it will, in the opinion of the Committee, be the duty of the Society henceforth to decline all contributions. To accept donations of specimens involves a tacit agreement to preserve

and exhibit them, an obligation up to which the Society will be quite incapable of acting.

In considering under these circumstances what measures to propose to the Society, the Committee must first think of what is possible. In the present state of the Society, and with its existing income, to support a general Museum as a Scientific Institution is clearly not possible, and it should not be attempted. The utmost that can be hoped for is to be able to rescue from destruction the existing collections and to preserve them until some time more propitious to Science may come. But before tamely accepting such a result, the Committee would suggest to the Society that an appeal should be made to the Government on this subject.

The motives which have led the Governments of all other civilized nations to establish Museums at their capitals apply with equal force in the case of British India.

Nor would arguments be wanting to show that the obligations on the British Government to endow a Museum at Calcutta have even more than usual cogency. For if such a patronage of Science is fitting in a national Government like that of England which affects no greater wisdom, no superior civilization, no larger liberality, than the mass of the citizens, does it not become a paramount duty in this country where the rulers are a handful of foreigners who claim for themselves the ability, if not the will, of taking the lead in all improvements.

The enlightened views which the Government of India have already displayed in the establishment of the University of Calcutta and the Geological Museum, and the intentions which it is understood to have in respect to the formation of College Museums, give reasonable grounds to hope that a proposition for the foundation of a National Museum at Calcutta might be favourably received by the Government at the present time; and considering what has already been said of the inability of the Society to maintain a Museum on any really satisfactory footing, the Committee trusts that the Society may be disposed to concur with them in the propriety of the proposal which they have made.

But they are strongly impressed with the conviction that in

making such a request to the Government, the Society should do all in its power to show the earnestness of its own views, and to afford positive proof of its willingness to co-operate with the Government in carrying out so important an object, and that the application of the Society should consequently be accompanied by an offer of the contribution of the Society's collections to form the nucleus of the Public Museum.

The Committee are aware of the strong objection that is felt by many Members of the Society to parting with the collections which have been accumulated under the Society's auspices and have so long been preserved in the Society's house. And fully sympathizing with these feelings, it is only on what they must consider to be certain proof of the inability of the Society to maintain and exhibit those collections in a manner worthy of its reputation as a Scientific body, or so as to be really available for students, or to lead in any way to the advancements of Science, that they make this proposal. They look upon it as quite unreasonable in itself to expect that the Government should keep up a Public Museum such as they have advocated, and the importance of which can be contested by no lover of Science, in addition to the Museum of the Society. And on merely scientific grounds they conceive that in the event of a really good Museum being established, such as they trust may be found possible, it would be most desirable that all the available collections both of Natural History and Geology should be united, and that the resources of the Museum, whether in reference to the contributions of specimens, or the means required for its support in men and money, should be as much concentrated as possible, and not divided between separate institutions.

The Committee would further remark that the fear expressed by some Members of the Society that the separation of the Museum from its immediate custody would lead to the dispersion of the Society or would diminish its usefulness is, in their opinion, quite unfounded. The Royal Society of London which, in the range of the subjects of which it takes cognizance is more akin to this Society than any of the other English learned Societies has never had any Museum; among those Societies possessing Museums not a few have found them causes of debt and difficulty, and most prejudicial to their interest;

while several have found it necessary to give up their collections altogether from reasons similar to those which now press upon this Society.

The Committee would also wish to explain in reference to their proposal that the Society should offer its collections to a National Museum, that they by no means advise that the collections should be handed over without conditions to be placed at the disposal of the Government. It might reasonably be expected that the Government would see the justice of admitting into the managing body of any Public Museum some representatives of the Society, which had presented so valuable a contribution as these collections, and which might always be expected to contain within its ranks the principal Scientific men of the country. But it does not seem necessary in the present stage of things to enter into further details on such a subject, nor would it be proper to introduce the mention of any conditions in first addressing the Government.

The question of the position of the Museum is another of those points which would require consideration, but the discussion of this too seems at present premature.

The Committee therefore conclude by reporting to the Council that they recommend that the consent of the Society should be requested to authorize the Council to communicate with the Government on the subject of the foundation at Calcutta of a National Museum on a fitting scale, and in a convenient situation, to which the whole of the Society's collections might be transferred.

(Signed) R. STRACHEY,  
W. S. ATKINSON,  
T. BOYCOTT,  
THOMAS THOMSON,  
E. SAMUELLS.

*Dated, 20th March, 1857.*

FROM C. BEADON, ESQ.,

*Secretary to the Government of India.*

TO THE SECRETARY, ASIATIC SOCIETY.

*Dated, Council Chamber. The 8th December, 1858.*

SIR,—I am directed to acknowledge the receipt of your letter

dated the 8th October last, submitting, on behalf of Home Dept. the Council of the Asiatic Society for the consideration of the Government of India, a proposal to found in Calcutta an Imperial Museum to which the whole of the Society's collections, except the Library, should be transferred on such terms as might prove satisfactory to the Members of the Society.

2. The Council appear to incline to the notion that the University of Calcutta, the Asiatic Society, and the proposed Imperial Museum, should all be located in one building, namely, the house belonging to and occupied by the Society, and that the Museum should be controlled by a Board selected from among the members of the University and of the Society.

3. It is apparently contemplated that the whole of the expense of the Museum, involving not only the maintenance and preservation of Natural History and other collections now belonging to the Society, but also their further extension should fall upon the Government, and that the Society's Funds should be charged only with the expense of the Library and perhaps the repairs of the building. The liability of the Government on this understanding would be indefinite or rather limited only by the amount it might choose to assign for the purpose. It is evident that some considerable additional expense would have to be incurred at once, as the funds of the Society, aided as they are by a monthly grant of Rupees 300 from Government, are insufficient for the proper maintenance and display of the specimens now in the Society's possession.

4. The President in Council without at all committing the Government to an approval of the scheme sketched out by the Council, recognizes it as a duty of the Government to establish in the Metropolis an Imperial Museum for the collection and exhibition of specimens of Natural History in all its branches, and of other objects of interest, physical, economical, and historical, when the existing pressure on the public finances shall have been relieved. At present the project is not one that can be entertained unless the Society can show that it may be adopted without incurring any considerable expense, and in that case many modifications would be necessary before it could be favourably received.

5. Meanwhile if it would be any convenience to the Society to

transfer its Geological and Palæontological collections to the Geological Museum, thereby at once relieving itself of the cost of maintaining them and rendering a considerable amount of room available for other purposes, the President in Council is prepared to renew the proposal made to that effect in my letter No. 1071 dated the 11th July, 1856, to which the Society at that time declined to accede.

I have, &c.

(Sd.) C. BEADON,

*Secretary to the Government of India.*

*From the Secretary to the Asiatic Society of Bengal.*

TO C. BEADON, ESQUIRE,

*Secretary to the Government of India,*

*in the Home Department.*

*Asiatic Society's Rooms, Calcutta, dated 6th April, 1859.*

SIR,—The Council of the Asiatic Society having had under consideration your letter dated December 8th, 1858, desire me to express the great satisfaction with which they have received the announcement it contains that the President in Council recognizes it as a duty of the Government to establish in the metropolis an Imperial Museum, although this announcement is coupled with an intimation that at present the project cannot be entertained unless the Society can shew that it may be adopted without incurring any considerable expence.

The Council do not wish to disguise the fact that a considerable outlay will ultimately be required in order to establish and maintain a public Museum on a scale befitting the requirements of Science and worthy of the Metropolis of India.

But a sum which the Council think could not be considered by the Government considerable, would enable the Society to maintain their existing collections in satisfactory order till the Public Museum can be established, and provide for their exhibition and their natural extension.

These collections will eventually if the proposed scheme be carried out, form the nucleus of the Public Museum, and the Council venture to think that the expenditure which is now required for their preservation and exhibition, might therefore, consistently with

the declared intentions of Government, be at once provided for at the public cost.

Total expenditure for the year, 1858.

Curator, . . . . . 3,480

Taxidermists, . . . . . 932

Servants, . . . . . 390

Cases, . . . . . 813

Contingent, . . . . . 239

Rs., . . . . . 5,854

The expense of the Museum for the last year in addition to the allowance made by Government has amounted to Rupees 2,254.

Deduct present Government

allowance, . . . . . 3,600

Rs., . . . . . 2,254

The Council has therefore directed me to solicit either a further grant of Rupees 200 per mensem in addition to the sum now contributed towards the support of the Museum, or, if it be deemed preferable, that the Government would take on itself the actual cost of the Museum within the limits of Rupees 6,000 annually under such check as may be thought suitable.

The aid thus solicited from the Government would, the Council think, not be perceptible as a burden on the finances, while it would for the present at least secure the valuable collections of the Society from the risk of deterioration to which the Council drew the attention of Government in my former letter on the subject.

With regard to the Society's Geological and Palæontological collections, the Council desire me to say that in the prospect of the establishment of a general museum which shall embrace all the branches of Natural History, it appears to them undesirable to separate temporarily one portion of the collections from the rest. Such a separation would only be an additional source of expense; the objects comprised in the Geological collection are imperishable, and their preservation now costs the Society nothing; were they removed, the rooms they occupy would necessarily require new fittings at a considerable outlay in order to make them available for



a better arrangement and display of other portions of the general collections.

I have, &c.

(Signed) W. S. ATKINSON,  
*Secy. Asiatic Society.*

*From W. Grey, Esquire, Secy. to the Govt. of India.*

*To the Secy. to the Asiatic Society.*

*Dated, Council Chamber, 3rd May, 1859.*

SIR,—I am directed to acknowledge the receipt of your letter, No. 95, dated the 6th ultimo, and in reply to inform you Home Dept. that the Governor-General in Council is unable to comply with the application preferred by the Council of the Asiatic Society for a further grant of 200 Rs. a month towards the support of the Society's Museum.

I have the honor to be, Sir,

Your most obedient servant,

(Sd.) W. GREY,

*Secy. to the Govt. of India.*

*Communications were received :—*

1st.—From Dr. G. Buist of Bombay, a paper on the Curia Muria Islands on the north-western border of the Arabian Sea.

2nd.—From E. Blyth, Esq., a paper on the Great Rocqual of the Indian Ocean, with notices of other Cetacea and of the Syrenia or aquatic Pachyderms.

3rd.—From the same, a paper entitled Notices and Descriptions of various Fishes.

4th.—From J. D. Gordon, Esq. Officiating Under-Secretary to the Government of India, Copy of a statement of Doodnath Tewarry, a convict in Port Blair who had lived for many months with the aborigines of the Island.

5th.—From Baboo Radhanath Sikdar, abstract of the results of the hourly Meteorological Observations taken at the Surveyor General's Office in the month of March, 1859.

The Ven'ble Archdeacon Pratt read a paper on the influence of Mountain-attraction on the determination of the relative heights of Mount Everest and the Mountains of Kashmir.

The thanks of the meeting were voted to Mr. Pratt for his valuable and interesting communication.

The Curator and the Officiating Librarian submitted their usual monthly reports.

#### LIBRARY.

The following accessions have been made to the Library since the Meeting in July last.

#### *Presentations.*

Selections from the Records of the Bengal Government, No. 30, Reports on the districts of Pooree and Balasore, by Henry Ricketts, Esq. 2 copies.

#### —BY THE BENGAL GOVERNMENT.

The Oriental Baptist for July, 1859.

The Oriental Christian Spectator for June and July, 1859.

The Calcutta Christian Observer for July and August, 1859.

Bibidhartha Sangraha for Joysto, 1781 Saka.

Reports of the Juries of the Madras Exhibition of 1857.

Official and Descriptive Catalogue of ditto.

Madras Exhibition of 1859 of the Raw products of Southern India.

General Report on the Administration of the several Presidencies and Provinces of British India during 1857-58. Part II. Appendices to Part II. of the Administration Report for 1857-58.

Selections from the Records of the Madras Government, No. 59.—Administration Report of the Madras Public Works for 1857-58.

Journal of the Agricultural and Horticultural Society of India, Vol. X. P. III.—BY THE SOCIETY.

Taj Bowree or Photographical Drawings at Beejapore.—BY THE HON'BLE THE COURT OF DIRECTORS.

Sitzungsberichte der Kaiserlichen Akademie der Wissenschaften. Philosophisch-Historische Classe. Band 23, Hefts 1, 2, 3, 4 and 5. Band 24, Hefts 1 and 2. Band 25, Hefts 1, 2 and 3. Band 26, Hefts 1 and 2. Band 27, Heft 1.

Ditto ditto Mathematisch naturwissenschaftliche classe. Band 23, Heft 2. Band 24, Hefts 1, 2 and 3. Band 25, Hefts 1 and 2. Band 26. Band 27, Heft 1. Band 28, Hefts 1 to 6. Band 29, Hefts 7 to 12. Band 30, Hefts 13 to 15.

Voyage de l'Eugenie.—Physique, Livraison, 1; Botanique, 1; Zoologie, 1 and 2; Physique, 1; *Stockholm*.

Monatsbericht der Koniglichen Preuss. Akademie der Wissenschaften zu Berlin, from January to December, 1858, 12 parts in 11. *Berlin*.

Memoires de l'Académie Impériale des sciences, belles-lettres et arts de Lyon. Classe des Lettres. Tomes 3, 4, 5 and 6. Classe des sciences, Tomes 3 to 7. *Lyon.*

Annales des sciences physiques et naturelles, 2nd series, Tomes 7 and 8. 3rd series, Tome 1.

Quarterly Journal of the Geological Society, Vol. 14, part 3rd, and Vol. 15th, part 2nd. London. By the G. Society.

Fontes rerum Austriacarum: österreichische Geschichtsquellen der Kaiserl. Akademie der Wissenschaften in Wien, Zweite Abtheilung, Bands 14, 15 and 17.—BY THE AUSTRIAN ACADEMY.

Archiv für Kunde österreichischer Geschichtsquellen, der Kaiserl. Akademie der Wissenschaften, Band 18, 2nd part, Band 19, 1st and 2nd parts.—BY THE SAME.

Bijdragen tot de Taal-land-en Volkenkunde Van Nederlandsch Indie. Tweed Deel, Tweed Stuk. Batavia, 1858.—BY THE BATAVIAN SOCIETY.

Almanach der Kaiserl. Akademie der Wissenschaften, 1858.—BY THE AUSTRIAN ACADEMY.

Notizenblatt, Beilage zum Archiv für Kunde österreichischer Geschichtsquellen, Wien, 1857.—BY THE SAME.

Monumenta Habsburgica, der Kaiserl. Akademie der Wissenschaften, Dritter Band, 1858.—BY THE SAME.

Die Principien der Heutigen Physik. Von der Kaiserl. Akademie der Wissenschaften. Von Dr. Andreas Ritter v. Ettingshausen, Wien.—BY THE SAME.

Festrede bei der Feierlichen Übernahme der Kaiserl. Akad. der Wissen. Von Dr. Theodor Georg Von Karajan. Wien.—BY THE SAME.

Mémoires sur les Contrées Occidentales par Hiouen-Tsang. Traduit du Chinois par M. Stanislas Julien. Tome II.—BY THE ROYAL SOCIETY.

Jahrbücher der K. K. Central-Anstalt für Meteorologie und Erdmagnetismus, von Karl Kreil, 5th Band. Wien, 1858.—BY THE AUSTRIAN ACADEMY.

Intégration der Linearen Differentialgleichungen, von Dr. Joseph Petzval, 5th Lieferung.—BY THE SAME.

Denkschriften der Kaiserl. Akademie der Wissens. Bands 8th, 13th and 14th, 1857 and 1858.—BY THE SAME.

Abhandlungen der Akad. der Wissensch. for 1857.—BY THE SAME.

Mémorie della Reale Accademia Della Scienze di Torino. Serie Seconda. Tome 17.—BY THE ACADEMY.

Proceedings of the Society of Antiquaries of London, 1857, pamphlet.

Abhandlungen für die Kunde des Morgenlandes, 1st Band No. 5, Leipzig, 1859.—BY THE GERMAN ACADEMY.

The Athenæum for May and June, 1859.—BY THE EDITORS.

Proceedings of the Royal Geographical Society of London, Vol. III. No. 3, 1859.—BY THE GEOGRAPHICAL SOCIETY.

Journal of the Statistical Society of London, Vol. XXII. Part 2nd.—BY THE STATISTICAL SOCIETY.

Response Mesurée de M. Stanislas Julien de M. Reinaud.

Question Scientifique et Personnelle de M. Reinaud, pamphlet, 2 copies.  
*Paris.*

Über Ghazzalis Leben und Werke, von R. Gosche, der Kaiserl. Akad. der Wissensch. Berlin.

Proceedings of the Royal Society, No. 343.—BY THE ROYAL SOCIETY.

Oriental Baptist, Vol. XIII. No. 152, for August, 1859.

Annual Report on the Sind Forest for 1858-59.

Ditto ditto of Grant Medical College, Bombay, for Session 1858-59.

Annals of Indian Administration, Vol. III. Part 2, for June, 1859.

Journal Asiatique for April and May, No. 51, 1859.

London, Edinburgh and Dublin Philosophical Magazine.—Nos. 116 and 117 of Vol. XVIII.

#### *Purchased.*

Annals and Magazine of Natural History, No. 19, for July, 1859.

Revue et Magasin de Zoologie, Nos. 5 and 6, 1859.

Ditto des deux mondes, for 15 June and 1st July, 1859.

Journal des Savants for May, 1859.

Comptes Rendus, Nos. 21 to 25, 1859.

Tables ditto, Tome XLII.

Literary Gazette, Nos. 51 to 54, 1859.

Westminster Review for July, 1859.



*Report of Curator, Zoological Department, for September, 1859.*

1. From Major H. B. Lumsden, 59th N. I., late in charge of the Kandahar Mission.

The skin and skull of a *Ghur-khur* (ASINUS ONAGER), as noticed in p. 237; horns of the *Ahu*, or Afghán and Persian Gazelle (GAZELLA SUBGUTTUROSA); and skins of TADORNA VULPANSER and FULIGULA FERINA from Kandahar: with specimens of a Lizard sent as the *Reg Máhi* from the same locality.

The species is SPHENOCEPHALUS TRIDACTYLUS, nobis, J. A. S. XXII, 654; but finer than those previously described, which latter were blanched in spirit. Those now sent are of a light brown colour above, paler below; with a darker reticulation of the upper parts, indicating the scutation. Head pale, with three dark lines, more or less broken into spots, one of them mesial, and the lateral passing through the minute eyes. Tail a third longer in what appear to be the males, than in what appear to be the females. Length from snout to vent of a presumed male,  $3\frac{1}{2}$  in., the tail  $2\frac{1}{4}$  in.; of a presumed female,  $3\frac{1}{2}$  and  $1\frac{3}{4}$  in.

Major Tytler has a pair of true SCINCUS OFFICINALIS, Laurenti, also from Kandahar, and bearing the same Persian name, which he spells *Raig Mahie* (meaning 'Sand-fish'); and both this and the preceding species, it appears, are sold in a dry state for medicine throughout India, as the true Scinque was formerly and is even now sold over a great part of Europe! The latter has not previously been recorded from so eastern a locality.

2. From Capt. Eales, commanding the 'Fire Queen' S. V. A specimen of the rare HAMADRYAS VITTATUS (*Naia vittata*, Elliot, *H. hannah* et *ophiophagus*, Cantor); from Port Blair!

3. From Babu Rájendra Mállika. A dead Orang-utan.

4. Major S. R. Tickell, Maulmein. A collection of specimens obtained in the mountainous interior of the Tenasserim provinces.

Of mammalia, only a fine skin of RHIZOMYS SUMATRENSIS, (Raffles), v. cinereus, McClelland.

Of birds, a highly interesting series, supplying fine examples of BULACA SELOPUTO, (Horsfield, *Strix pagodarum*, Tem.), BUCEROS TICKELLI, nobis (J. A. S. XXIV, 266, 285), and PODICA PERSONATA, Gray; with a few species hitherto undescribed, and numerous specimens of others excellently prepared.

HUHUA ORIENTALIS; *Strix orientalis*, Horsfield: *Str. sumatrana*, Raffles, (juv.); *Str. strepitans*, Temminck; *Huhua nipalensis*, Hodgson; *H. pectoralis*, Jerdon. A nestling specimen, corresponding to the descrip-

tion of *Str. sumatrana*, Raffles (*Lin. Tr.* XIII, 279). Both old and young are figured by Temminck, *p. c.* 174, 229.

*BUCEROS TICKELLI*, nobis, *J. A. S.* XXIV, 266, 285; being a second species of the genus *ANORRHINUS* of Reichenbach. The specimen originally described was an incompletely mature female, with the casque not fully developed. Two mature males resemble it in plumage, except that the rufescent hue of the lower parts is brighter, and that the wing-feathers are more conspicuously pale-edged, as in the nearly affined *B. GALERITUS*, Tem. The casque resembles in shape that of *B. GALERITUS*, but with the bill is wholly yellowish-white, weakly infuscated on the fore-part of the casque, and shewing a coral-red spot at the base of the lower mandible. The frontal feathers behind the nostrils radiate forwards, so as to conceal the hind-part of the casque, and in one specimen these are much tinged with pale fulvous. Tips of the coverts of the primaries white, to a greater or less extent, forming a small spot on the wing. Length of wing exactly 12 in.; of middle tail-feathers the same; bill from gape  $4\frac{3}{4}$  in., and its total height, including casque, 2 or  $2\frac{1}{2}$  in. "Irides grey within brown."

*PICUS ATRATUS*, nobis, *J. A. S.* XVIII, 803. Originally described from a tail-less and otherwise much injured female. A fine perfect specimen of a female is now sent, but the male is still a desideratum. The six medial tail-feathers are wholly black, and the penultimate has only one subterminal white bar on its inner web, and three on its outer web, besides the white extreme tip. Chin whitish; the throat with medial black streaks: on the rest of the lower parts these are narrower and more confused, and the flanks are as indistinctly barred; while the pale portion of the feathers is deeply tinged with golden yellow. Total length 8 in., of which tail 3 in., and closed wing  $4\frac{3}{4}$  in.: beak to forehead  $1\frac{1}{2}$  in. "Irides carmine."\*

\* Another new Woodpecker of the same group we have lately received from Port Blair, being as yet only the second new species of bird from the Andamán islands,—the other being the fine *Shama* (*KITTACINCLA ALBIVENTRIS*, nobis, *J. A. S.* XXVII, 269); of which more specimens have since been received,—unless the Oriole (*J. A. S.* XXVIII, 272,) should prove to differ from *C. CORONATUS*, which I still think probable.

*PICUS ANDAMANENSIS*, nobis, *n. s.* Nearly affined to *P. ANALIS*, Tem., of Java, which it resembles in size and proportions,—as also *P. PECTORALIS*, nobis (*J. A. S.* XV, 15),—all three differing from the common *P. MACEI* of Bengal by their smaller size and white-spotted middle tail-feathers: in *P. MACEI*, as also in the affined Himalayan *P. BRUNNIFRONS*, the four medial *rectrices*, and in *P. ATRATUS* the six medial *rectrices*, are spotless black; the last named being also the largest species of this particular group: in *P. ANDAMANENSIS* the middle tail-feathers have three distinct pairs of white spots, while in *P. PECTORALIS* they have four pairs of white spots of larger size: but the Andamánese bird is specially characterized by the large round black spots upon its breast, each margined with whitish; the ear-coverts, also, are longitudinally streaked with black, and the flanks are more conspicuously rayed than in the others. In other

*UROCISSA MAGNIROSTRIS*, nobis, *J. A. S.* XV, 27. As usual in Burmese specimens, the bill is larger and the blue of the plumage is distinctly more intense than in the Himalayan *U. OCCIPITALIS*.\* "Male. Irides orange."

*PARUS SUBVIRIDIS*, Tickell, nobis, *J. A. S.* XXIV, 267. Much injured specimen, but in finer and fresher plumage than the one previously obtained, and satisfactorily confirming the species. "Female. Irides sepia."

*SIBIA MELANOLEUCA*, Tickell, *n. s.* A fourth species of this genus,† akin to *S. CAPISTRATA* and *S. GRACILIS*; of a sooty-black hue above, the crown intense black, and a faint green shine on the wings: lower parts white, slightly sullied, but a small black space on the chin. Wings white at base internally, save on the first two primaries. Outermost and penultimate tail-feathers broadly tipped with white, the rest successively less so, and merely the extreme tips of the middle pair. Length about  $9\frac{1}{2}$  in., of which the tail is half; closed wing  $3\frac{1}{2}$  in.; bill to gape  $\frac{7}{8}$  in.; and tarse 1 in. "Male. Irides sanguine."

*IXULUS STRIATUS*, nobis, *n. s.* A fourth species of this genus, affined to *I. CASTANICEPS*, Moore, *P. Z. S.* 1854, p. 141,‡ and like that species with

respects this bird resembles *P. MACEI* (and I believe *P. ANALIS*). The lower tail-coverts are bright crimson; and the crimson tips of the coronal feathers of the male are less developed than in *P. MACEI*, especially towards the forehead. Length of beak to gape 1 in.; of closed wing  $3\frac{7}{8}$  in.; and of middle tail-feathers  $2\frac{1}{2}$  in.

Our list of Andamánese birds, examined and positively determined, is still scanty. To the few noticed in *J. A. S.* XXVII, *et seq.*, and in XXVIII, 271 *et seq.*, may be added *PALEORNIS ALEXANDRI*, *P. ERYTHROGENYS*, nobis (*nicobaricus*, Gould, heretofore only known from the neighbouring Nicobar group), *TODIRHAMPHUS COLLARIS*, *GRACULA INTERMEDIA*, and *ANOUS STOLIDA*; but in other classes (that of fishes especially) we have received largely. Here I shall only remark, concerning the Parrakeet, that three distinct species of *PALEORNIS* have received the name *erythrogenys*; which was first bestowed by M. Lesson on the common *P. LONGICAUDA*, (Boddäert; *Ps. malaccensis*, Gm., *nec* Latham, of which *P. viridimystax*, nobis, proves to be the young),—secondly, by myself on the species inhabiting the Andamán and Nicobar islands (since designated *nicobaricus* by Gould),—and thirdly, by Mr. L. Fraser to what appears to be the original *BARBATUS*, Gmelin (identical with *Luciani*, Verreaux, and *Fraseri*, Moore): the *habitat* of the last is still uncertain.

\* At a Meeting of the Zoological Society, held on May 10th. of this year, "Mr. Gould exhibited specimens of the four known species of the genus *UROCISSA*,—*U. SINENSIS*, from China,—*U. OCCIPITALIS* of the Eastern Himalaya,—*U. MAGNIROSTRIS*,—and *U. FLAVIROSTRIS*; and pointed out their distinctive characters." *Athenæum*, May 14th, p. 651. The last three were named by myself in the Society's Journal. *U. OCCIPITALIS*, however, is not from the eastern, but from the western Himalaya; *U. FLAVIROSTRIS* is the only species which I have seen from the eastern Himalaya, and this also inhabits Kashmir, according to Lord Arthur Hay.

† Vide *J. A. S.* XXIV, 271.

‡ Here I may remark that I doubt exceedingly the *habitat* assigned to this species—"Afghánistân." The late Mr. Griffith's specimens, in various classes, from Afghánistân and the Khásya hills, got mixed up together, and in this way several Khásya species have come to be described as inhabiting the widely dif-

graduated outer tail-feathers. Bill moderately stout, as in *I. OCCIPITALIS*, nobis. Length about 5 in., of closed wing  $2\frac{3}{8}$  in., and of tail the same : bill to gape  $\frac{1}{2}$  in. ; and tarse  $\frac{5}{8}$  in. Colour greyish-brown above, each feather with a white mesial streak ; below albescent throughout : outermost tail-feather  $\frac{3}{4}$  in. shorter than the middle pair, and largely tipped with white, as is also the next, and the ante-penultimate and next within gradually less so, the outer four feathers successively graduating.

*ABROENIS SUPERCILIARIS*, Tickell, *n. s.* Another of this numerous group, yellowish-green above, pure yellow below : the cap light ashy, with a well defined white supercilium, and also a white throat : rictal vibrissæ unusually developed : tail uniform yellowish-brown without markings ; its upper coverts yellow ; bill dusky ; and the legs pale and probably yellowish. Length 4 in., of wing 2 in., and tail  $1\frac{1}{2}$  in. ; bill to gape  $\frac{1}{16}$  in. ; and tarse  $\frac{3}{4}$  in. The short first primary is half as long as the second, and two-fifths as long as the fourth and fifth which are longest. “Irides sepia.”

*PELLORNIUM TICKELLI*, nobis, *n. s.\** Smaller than *P. RUFICEPS*, but absolutely typical in structure. Colour uniform brown above, much paler and tinged with rufous below, the middle of the belly pure white ; frontal and loreal feathers pale-centred, more or less. Upper mandible pale dusky, the lower whitish or probably pale carneous, as are also the legs. “Irides sepia.” Length  $5\frac{1}{2}$  in., of wing  $2\frac{1}{2}$  in., and tail 2 in. ; bill to gape  $\frac{3}{4}$  in., and tarse 1 in.

To this genus I now refer *P. FUSCOCAPILLUS* (*Drymocapthus* apud nos, *J. A. S.* XVIII, 815), from Ceylon ; and the *DUMETIÆ* are barely separable. An example of *P. RUFICEPS* is with Major Tickell's specimens.

*TURDINUS GUTTATUS*, Tickell, *n. s.* This deviates a little from the three species previously described,† in not having the feathers dark-margined (as in most *OREOCINCLÆ*), while the speckling of the sides of the neck is peculiar. Colour a rich deep ruddy-brown, more rufescent on the tail-coverts and tail ; the throat pure white, bordered on either side with a black moustache, above which is a white spot : rest of the lower-parts deep rufo-ferruginous, tinged with fuscous on the flanks and lower tail-coverts, and shewing a slight medial whitish line : loreal feathers black with greyish-white lateral edges ; the frontal feathers stiff as usual : ear-coverts brown : behind the eye an ill-defined streak, and behind the ear-coverts a great

ferent climatal region of Afghánistán. *Vide J. A. S.* XXII, 413. The *URVA CANCRIVORA*, Hodgson, among mammalia, is another instance, assigned to Afghánistán on the supposed authority of Griffith.

\* As the specific name suggested by Major Tickell is a one of the synonymes of *P. RUFICEPS*, I therefore name the specimens as above.

† *Vide J. A. S.* XXIV. 269 *et seq.*



patch of feathers, each having an oval white mark set off with black, and other feathers thus marked across the nape. Bill plumbeous; and legs plumbeous-brown. "Female. Irides sepia." Length 6 in., of wing  $2\frac{3}{4}$  in., and tail  $2\frac{1}{2}$  in.; the plumage extremely copious over the rump; bill to gape 1 in.; and tarse 1 in.

TROPICOPERDIX (nobis) CHLOROPUS, Tickell, *n. s.* A third species of this group, which is founded on PERDIX PERSONATA, Horsfield, of Java, and P. CHARLTONI, Eyton, of Penang and Province Wellesley, which latter the present bird exactly resembles in size and structure. The form comes near to ARBORICOLA, but the straight claws are much less developed, and there is a characteristic difference of plumage. The present species differs from TR. CHARLTONI, in having the interscapularies unmottled olive-brown, crossed with numerous black rays on each feather; the supercilium is more delicately pencilled, and the ear-coverts are not ferruginous, but white with black spots like the throat, and below the throat there is a broad ferruginous band also with round black spots; breast similar to the back, olive-brown with numerous blackish cross-rays, below which the under-parts are ferruginous, paling at the vent and interior of thighs: the flanks have no well defined broad black bands, as in T. CHARLTONI, but are prettily mottled with dusky in a manner difficult to describe; and the same remark applies to the wing-coverts: tail freckled and marked with zig-zag dusky bands. Bill wax-yellow, crimson towards gape in both mandibles; and the legs yellowish-green. Length of wing 6 in., of tail 3 in., of bill to gape 1 in., and of tarse  $1\frac{3}{4}$  in. "Irides brown."

PODICA PERSONATA, G. R. Gray. Two specimens, male and female: the former having a black chin and throat; ending in a point half-way down the neck, and narrowly margined throughout with white which commences behind the eyes; the forehead also black, continued into a supercilium: the latter having the chin and throat white, bordered throughout with black indicating the periphery of the black patch of the male, and beyond this the same external white border; supercilia black as in the male, but not the forehead. In both, and in a third specimen formerly sent by the late Major Berdmore, there is a triangular naked space at base of the upper mandible, the base of which is even with the forehead, and the adjacent feathers behind it being white. Length of male  $1\frac{3}{4}$  ft., of wing 10 in., and tail 5 in.; beak to forehead 2 in., tarse  $1\frac{3}{4}$  in., and middle toe and claw 3 in. "Irides of male sepia; of female pale yellow." The difference, however, has more the appearance of summer and winter plumage, than of sexual diversity.

Various Himalayan (and, more especially, S. E. Himalayan) species form part of this collection; of which may be enumerated, as shewing the geogra-

phic range, *HIERAX EUTOLMOS*, *ATHENE BRODIEI*, *VIVIA INNOMINATA*, *CISSA SINENSIS*, *LEIOTHRIX ARGENTAUROS*, *MINLA CASTANICEPS*, *ALCIPPE NIPALENSIS*, *MUNIA ACUTICAUDA*, *GAMPSORHYNCHUS RUFULUS*, *PRATICOLA FERREA*, *RUTICILLA LEUCURA*,\* *ANTHITES GULARIS*, *ENICURUS SCHISTACEUS*, *NILTAVA GRANDIS*, *CRINIGER FLAVEOLUS*, *ARACHNOTHERA MAGNA*, and *DUCULA INSIGNIS*; also the *PSARISOMUS DALHOUSIE*, accompanied by *CORYDON SUMATRANUS*, *EURLAIMUS JAVANICUS*, and the beautiful *SERILOPHUS LUNATUS*, which is replaced in the S. E. Himalaya by *S. ERYTHROPYGUS*. Two of the foregoing species I have also seen in Malacca collections, viz.: *HIERAX EUTOLMOS* and *MUNIA ACUTICAUDA*. A superb male of *SERILOPHUS LUNATUS* has the silky-white crescent not confined to the side of the neck, but passing completely across in front. *ZOSTEROPS FLAVUS* (*Dicaeum flavum*, Horsfield,) is also sent, being previously known to inhabit only Java and the Philippines.

The specimens of *DUCULA INSIGNIS* in the Society's museum, from Sikhim and Arakan, were considered by Dr. Jerdon to be distinct from his *D. CUPREA* of S. India, which latter perhaps is the true *BADIA* of Raffles. The Tenasserim specimen now received (a female) is pure pearl-grey on the crown and cheeks, and more distinctly ashy on the lower parts, than in a Sikhim female; which latter has the crown, cheeks, and lower parts much tinged with ruddy; whilst an Arakan specimen (also *probably* a female) is intermediate.

Two packages have since been received from Major Tickell. The first containing an Arctic bird, most remarkable for occurring within the torrid zone, "in Lat. 16° 22' North!"

*CATARRACTA POMARINA*, (Tem). In adult plumage. "It was picked up," remarks Major Tickell, "or rather I should say knocked down, by some village boys in a swampy meadow about five or six miles south of Moulmein. There had been very heavy weather in the Bay for some days past; but the singular thing is, that this bird should have ranged so wide from its usual haunts as to come within the influence of our tropical monsoon.

"The fact is more curious even than that of the *EMBERIZA AUREOLA*, a Siberian bird, being found in such vast flocks here every cold weather. It supplies with us, in fact, the place of the 'Baghairi' (*CALANDRELLA BRACHYDACTYLA*) in Bengal.

"Another singular occurrence is the breeding of the 'Gargany' (*ANAS QUERQUERDULA*) in this part of the country. I have a young one now

\* *Muscisylvia* and since *Myiomela leucura*, Hodgson. I agree with Major Tickell that this species can hardly be separated from *RUTICILLA*.

alive which was brought to me, when just fledged, from a pond or small lake about twelve miles off.”\*

To the foregoing notices may be added the fact that I procured a specimen of *PHALAROPUS FULICARIUS* in the Calcutta provision bazar, on May 11th, 1846. Though so late in the season, it had not begun to assume the summer colouring; and it was miserably lean, though the plumage was in good order for stuffing. The late Prince of Canino records the occurrence of this species so far south in America as the lake of Nicaragua (the *Cocibolca* of the aborigines), in lat. 12° north!

Still more remarkable, Dr. L. C. Stewart obtained a specimen of *LOPIPES HYPERBOREUS*, an arctic species very rare even in North Britain, in the vicinity of Madras!† It is now, together with the last, in excellent preservation in our museum.

The delicate *CALLIOPE CAMTSCKATKENSIS* is common in the neighbourhood of Calcutta during the cold season; but I have never seen it from any part of the Himalaya. Von Wrangell, however, tells us that this particular species (which cannot well be confounded with any other) arrives “early in April, with the Snowfleck, in the Lower Kolyma district” in Northern Siberia!‡

The ‘Pomarine Skua’ sent from Burma by Major Tickell is in adult plumage! In general, the young of migratory birds proceed further equatorially than the adults; and, as instanced by the present species, various arctic birds that have occurred in the British islands or surrounding seas

\* In *Tom.* XLIII, p. 644, of the *Comptes Rendus*, the late Prince of Canino remarks—“*Mon Lestris Hardyi* n’ est admis comme espèce ni à Leyde où on le nomme *Lestris parasiticus*? ex Malasia, Boiè; ni à Berlin où le seul qu’on possède a été pris en pleine mer entre les Philippines et les îles Sandwich. M. Cabanis l’a étiqueté *Lestris crepidata*.”

The Gargany and the Pintail are the two commonest species of Ducks in Lower Bengal during the cold season, at least they are brought in by far the greatest numbers to the provision-bazars, and are, pre-eminently, the ‘wild Duck’ and ‘Teal’ of our tables. Our most common Pochard is the ‘White-eye’ (*FULIGULA NYROCA*). The Gadwall, Shoveller, Widgeon, and true Teal, are tolerably common, as also the Red-crested, the Tufted, and the Dun Pochards: the Shieldrake is not rare: but the Mallard I have never seen yet, though assured that it has been shot so near as at Ránigánj. *CASARCA RUTILA* is common, of course; and the non-European species I here pass over.

It may be remarked, however, that a Duck from Abyssinia which Dr. Rüppell sent us for *A. PÆCILORHYNCHA*, and which is described as *A. Ruppelli* in *J. A. S.* XXIV, 265, proves to be *A. FLAVIROSTRIS*, A. Smith, figured in the *Zoology of S. Africa*. The only difference is, that the neck in the figure is represented to be minutely speckled, instead of being streaked with a dark median line on each feather; and there is no discernible dusky mark through the eye in the Society’s Abyssinian specimen. The description, however, demonstrates their identity.

† Vide *J. A. S.* XXIII, 214.

‡ ‘Narrative of Expedition to the Polar Sea,’ Sabine’s translation, p. 52.

have visited them only in the garb of immaturity. The Pomarine Skua is there an exceedingly rare winter visitant in its adult dress; and a recent instance of such a specimen occurring, at the Land's-End, is made the subject of a paper appended to 'the Fortieth Annual Report of the Royal Institution of Cornwall' (1858), which I have just received.

Major Tickell's subsequent package contains the skin of a Squirrel, which is only our second specimen of—

*SCIURUS BERDMOREI*, nobis, *J. A. S.* XVIII, 603. This species, according to Major Tickell, "infests paddy fields. It is in fact more terrestrial than arboreal, or at least fully as much so. You will remark its long muzzle and flat head—strongly resembling that of the *TUPAIA*." Nevertheless, though approximating—it cannot range in the peculiar group designated *RHINOSCIURUS* by Dr. J. E. Gray; undescribed by him, but a species from Singapore noticed by the name of *RH. TUPAIOIDES*, Gray, in p. 195 of his 'Catalogue of the Specimens of Mammalia in the British Museum.' It is also doubtfully referred by him to *SC. LATICAUDATUS*, Müller, figured and described by Dr. S. Müller and Prof. Temminck. We also possess what must doubtless be Dr. Gray's species, from Singapore; and it can hardly be other than that noticed by Dr. Cantor in *J. A. S.* XV, 251. Dr. Cantor, however, describes the fur to be "soft and delicate." In our specimen (and I selected it from others like it) the fur is somewhat coarse, and the piles do not lie straight and smooth, but have a harsh and rough appearance. He also describes his Pinang species to "differ from the diagnosis of *SC. LATICAUDATUS*, from the west coast of Borneo, in having neither the first nor the fifth molar of the upper jaw very large. Both are of nearly equal size, and much smaller than the rest." In our Singapore specimen, the first upper molar is unusually large for a *SCIURUS*, but not more than half so large as the last of the series, which latter is of equal size (or very nearly so) with the fourth. The skull exactly agrees with that of *SC. LATICAUDATUS*, as figured by Dr. S. Müller, as does also the size of the first upper molar; and there is the same remarkable elongation and reduced vertical depth of the maxillaries, with their inferior outline exhibiting a straight line from the rodential tusks to the molars; the upper rodent teeth are also singularly small, and the lower elongated and almost straight,—their enamel being of a pale orpiment-yellow colour: the ear-conch is remarkably short, bearing a great resemblance to that of *TUPAIA*; and, as viewed from a little distance, it is curious that there is even the same pale line on the side of the neck as in the *TUPAIÆ*, but broader and less defined or more diffuse. In this specimen the tips of the caudal hairs are white, imparting a grizzled hoary appearance; and the fur of the upper parts, head and limbs, is much more mixed with black than in Dr. S.

Müller's coloured figure of *SC. LATICAUDATUS*, and of the lower parts dull white without any rufescent tinge. The two are probably affined species rather than identical.

In *SC. BERDMOREI* the skull is that of an ordinary *SCIURUS* of the 'Palmist' group, to which the species strictly appertains, as indeed is further evidenced by the markings of its coat; it being the largest of the Palmists with which I am acquainted; and moreover the habits (as described by Major Tickell) are just those of other Palmists. Neither in the form of its ear-conch, nor in the attenuation of the maxillaries and reduced size of its gnawing teeth, does it approximate the *RHINOSCIURUS* type; and the enamel of the tusks is of the usual dark brownish-orange colour. The fur, however, is very like that of a *TUPAIA*, but for the usual longitudinal stripes that distinguish the Palmist Squirrels.\* The specimen formerly presented by the late Major Berdmore from Mergui was a fine male, of a brighter colour than Major Tickell's female now sent, having in fact a newer or less worn *pelage*; but the species is obviously one and the same. It has three dorsal black stripes from the shoulder to the croup, the lateral bordered externally by a yellowish-white stripe, and there is another yellowish-white stripe on each side below, separated and set off above and below with blackish; lower parts white with a strong rufous tinge, and in the Mergui specimen more especially this rufous is rather deep on the internal border of the thighs and at the base of tail underneath; the head is very rufescent in both specimens; and the tail in that from Mergui is deep rufous underneath along its middle, with first a narrow and then a broad longitudinal band, the latter set off with yellowish-white tips, which grizzle also the upper surface of the tail. In the other specimen, which appears to have been younger, in addition to having more worn and abraded fur, the colouring of the tail is the same, but much duller. Length of head and body about 8 in., with tail of the usual proportions: skull just 2 in. long.

*HALCYON LEUCOCEPHALUS*, (L).; *H. gural*, Pearson. Variety, with albescent cap, sufficiently so quite to explain the specific name, if founded upon a specimen thus coloured.

Since this Report was drawn up, Major Tickell has favored the Society with more elaborate descriptions of his specimens, which are awaiting publication. We have also received from him a fine specimen of a fish from Port Blair, the *SYNANCEIA BRACHIO*, C. V., of the *Histoire des Poissons*.

E. BLYTH.

\* 'Palm Squirrel' is a misnomer; these animals shewing no particular partiality for palms, that ever I could perceive.

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# JOURNAL

OF THE

# ASIATIC SOCIETY.

No. V. 1859.

*Itinerary, with Memoranda, chiefly Topographical and Zoological, through the southerly portions of the district of Amherst, Province of Tenasserim. With a Map.—By Major S. R. TICKELL, 31st Regt. B. N. I. and Deputy Commissioner of Amherst.*  
*And Copious Botanical Notes.—By the Rev. C. S. P. PARISH, Chaplain of Moulmein.*

The following observations pretend to little more than to furnish the route through an extremely wild, in parts utterly unknown and, generally speaking, uninteresting country and people. A considerable portion of this journey was through a tract hitherto unvisited by any European, and in this region were traversed wide intervals, utterly devoid of human inhabitants of whatsoever kind. Wild and unprofitable as the country may now appear, it forms part however of the most accessible line of inland communication between Moulmein, and the capital of Siam, Bangkok; and for this reason alone, the notes here collected may not be altogether useless.

A glance at any Map which includes this part of the world, on however small a scale, shows that the province of Tenasserim is a comparatively narrow strip of land, forming a seaboard to the great southern spur or branch of the Himala, called in Arracan and Burma the Yomadoung (or back bone mountains) which extends southward skirting the districts of Amherst, Tavoy and Mergui, till it passes into the Malayan peninsula. This narrow strip has for its western boundary, from the furthest south, the sea, as far north as Amherst, whence the demarcation is continued northward

along the Thanlweng (*Anglicè* Salween) river as high as about Lat.  $17^{\circ} 52'$  N. about which parallel commences the Shan territory of Zimmey.

Between the above parallel and that of  $15^{\circ} 20'$  N. the land slopes down from N. E. and S. to the basin of Moulmein, so that at, or close to that town, the waters of the Thanlweng from the N., the Gyíng from the N. E., and the Attaran from the S., all join together, ere pouring into the sea. It is a rare topographical feature to find rivers running in such directly opposite courses in so small an area, and having their confluences at such obtuse angles as the Gyíng and Hounghthrau. It is evident however that the great watershed is to the S. E. from whence the rivers flow, until stopped by the drainage from the north, the main receivers of which are the Thanlweng and Gyíng, into which the rivers from the southward of necessity flow, and are forced back by the former into a common current debouching into the Thanlweng.

These rivers may be briefly thus described. The Thanlweng which comes from far to the northward in a straight course and from very elevated regions (perhaps 15,000 feet above the sea) is clear, sandy and rapid; until within forty miles of its mouth. The Gyíng, a very short and tortuous river, is muddy, deep, and sluggish; and the Thoungyen, and Hounghthrau are narrow, rocky, sandy, but not very swift hill streams, of great length for their size; while the Attaran is muddy, narrow, slow, very deep, and navigable for one fathom draught for about fifty miles from its junction with the Gyíng. At this spot (fifty miles up) two hill streams, the Zum-mee, and the Wenyau, clear, sandy, shallow, and not very rapid, join; and their united waters constitute the Attaran.

The whole of the country traversed by these rivers may be briefly described as buried under one vast forest, dense in the hills and their spurs, and on the banks of the streams running from them; and opening out into extensive swamps between the rivers, where the ground usually sinks below the level of drainage, and, being annually flooded by heavy rains, does not admit of the growth of forest trees, or of more persistent vegetation than giant grasses and Arundinaceous plants. Between these two extremes, the natural slope of the land admitting of drainage, and consequently of



moderate natural irrigation, the ground is seized upon for cultivation—chiefly of rice, and, in higher spots, of certain favorite fruit trees, the amount of orchard compared to cereal culture being very large. The whole area thus under cultivation at one time, (for many of the fields, which get exhausted and are never manured, are abandoned every fourth or fifth year to renovate themselves by lying fallow) may be reckoned at one twentieth of the whole country. The cleared and cultivated patches in the hills themselves are too few to interfere much with this calculation.

The population of the district is of course most dense at and near Moulmein. Biloogewn island, most parts of the east banks of the Thaulweng, the Gyíng, and the lower parts of the Attarau, are tolerably well peopled, and inhabited by Talyngs. Further up the rivers and near the foot of the hills the population is chiefly Karén, and scattered, and two or three localities are stocked with Tounghthoos, a tribe whose head quarters appear to be in the Martaban district. These, with a sprinkling of Shans along the Hounghthrau, constitute the population, irrespective of settlers from East Bengal and Coringa.

Having now attempted a general view of the country and its inhabitants, without entering too much into dry statistical details, I proceed to give a slight retrospect of our journey up the Attarau and Zummee, through the Shan districts of Kyouk-khoung\* and Lengka, to the Hounghthrau river, and down it, after a divarication to the highest point of the range on its East, home—the journey occupying from the 31st January to the 7th March, 1859, and comprising a tour of 450 miles in length.

*January 31st, 1859.*—Mr. Parish and I left Moulmein (or rather Obo, its north-easterly suburb) at 0h. 30m. P. M. We were travelling in boats, one, a seven oar, for ourselves, and four others of about the same dimensions conveying our baggage and followers, together with office writers, clerks, and police. These boats, which are of Burmese build and exceedingly long for their beam, are hollowed out of a single tree (the *Hopea Odorata* or Thengar) and built up with teak topsides, thwarts, flooring, and lockers; and with bamboo and

\* Literally “Hollow Stone” a remarkable cleft, gully, or narrow pass amongst rocks, from which the district takes its name.

mat awnings. They are pleasant enough for two or three hours, but get terribly irksome afterwards, from the confined crouching position they entail. We had the flood tide with us, and, rapidly skirting the suburb of Obo, turned into the Attaran river about 1 P. M. and proceeded up it at the rate of about five to five and a half miles an hour. Stream at its mouth about 150 yards wide; deep and muddy, with low country on either bank. High grass and mangrove-like jungle to our left hand, and the open and populous space surrounding Moulmein to our right. Course S. and S. E. Scattered hamlets on either side, with low (high bush) jungle, till 2 P. M. when we got to Kyik parang, where we were to have halted; but, finding it too early, proceeded and reached the next eligible place for passing the night, Kwan-ngan, at 5.15 P. M. Heartily wearied. We brought the flood the whole way with us, and I calculated the distance at twenty-three miles. About three miles back we passed most romantic scenery. A range of perpendicular rocks, called the Pya dOUNG, of mural limestone, rise sheer out of the water to six or eight hundred feet, on the right or eastern bank of the river; and some extraordinary bold, scarped, insulated rocks are scattered also along the opposite side. On the pinnacles of these rocks we observed numbers of adjutants. These huge birds breed here annually and the rocks are in many places conspicuously white with their dung. There are two species of adjutant—*Leptoptilos Argeela* (our old Calcutta friend) and *L. Javanicus* (a rarer visitor in Bengal), and both breed together on these inaccessible places. The *Argeela* is notably larger than the other: but the eggs of the two species are hardly to be distinguished apart. The villagers of Kwan-ngan are Talyngs.—a heavy, large, good tempered set. They had prepared and cleaned out for us a tolerably comfortable zeyat or serai. Close to this was the village Kyoung, which is always a handsome substantial wooden building, occupied by Phoongyees or priests, and serving generally as schools for the village children, who are taught reading, writing and cyphering by the phoongyees; the latter thus make some return for the benefits they receive from the parents, and this mitigates in some respect the disgust that the whole system of priest worship in Burmah excites.

Rated the Chronometer at 8 P. M. and found it had sensibly changed, in spite of the very gentle motion it had had.

*February 1st.*—Thick fog at 7 A. M. and Thermometer  $68^{\circ}$ . Halted till noon. Took Observation at 8.30 A. M. for error of Chronometer (assuming this spot to be 8' E. of Moulmein or 6h. 31m. E. of Greenwich, which it is as nearly as possible). Took meridian Observation © and made Latitude  $16^{\circ} 20' N$ .

Started at 2 P. M. and reached *Attaran* at 5h. 20m. P. M., distance fifteen miles. River as yesterday. Thick jungle on both banks and elephant grass. On the way we passed a range of limestone rocks similar to those of yesterday, and on the same (the east) side of the river, but considerably higher, rising perhaps to 1500 feet. The range is about one and a half mile in length, nearly parallel to the river, but at last joining it at a very acute angle, and jutting into the water, where the rocks form most fantastic caves, hollow domes, and pendants like stalactytes hanging over the stream. At the southerly end of the range, they are completely permeated by an oven shaped cave, through which a small tributary falls into the *Attaran*. We pulled into and through this singular water vault, and from the other side I made a sketch of the scene, looking back to the main river. The limestone here was very hard and compact, in fact a coarse marble, but the people told me it had never been worked. The land at the back of the rocks was being cleared by a roving band of *Karéns*. Adjutants were numerous on the summit.

*Attaran*, which is a tolerably large hamlet, is built in the elephant grass, which absolutely overshadows the doors; and though this species of vegetation fosters mosquitoes to a degree quite unknown in Hindustan, and though the clearing the whole village of the grass would not be a day's job, yet so lazy and apathetic are the people that they will not take the trouble to cut down a blade! Their only resource is to sit in the evening, and sleep in smoke that would excite universal ophthalmia in less callous beings. I need scarcely say that from sunset till we got inside our curtains, I and my companion were in a state of complete torment.

*February 2nd.*—Procured a specimen of the little "black and red Indian falcon," (*Hierax Eutolmos*) a beautiful little burlesque on the large and savage falconidæ. The country in the interior (we are on the left bank) is an immense extent of high grass, scattered sparsely with timber, many of the trees dead.

Observation at noon gave Latitude  $16^{\circ} 12' 39''$  N. ; Longitude by Chronometer  $97^{\circ} 49'$  E. or  $12'$  East of Moulmein.

Started at 2h. 20m. P. M., ebb against us one hour. Reached *Padowk* at 5h. 30 P. M., run fifteen miles. Course S. E. by-E. Six miles from Attaran we reached the site of the old fort of that name, opposite which the Zummee and Wenyau join. The latter comes from the S. The Zummee from E. S. E. We turned into the latter. The river very deep, 100 to 140 yards wide, banks mud, and high grass. Flood tide sensibly helping us. *Padowk* we found buried in elephant grass. The mosquitoes swarmed and stung us to madness, and we were obliged to eat our dinner sitting in the smoke of wood fires.

*February 3rd.*—Latitude  $16^{\circ} 6' 23''$  N. ; Longitude  $98^{\circ}$  E.

Started at 35m. P. M. against the ebb. River much as yesterday, but more abruptly winding. Banks are increasing in height, rise and fall of tide (springs) about four feet. Little of note to be seen in the monotonous forest on both banks, save a few fishing monkeys (*Macacus cynomolgus*) peeping at us through the bushes, and immediately quarrelling with each other. At 3h. 25m. reached *Kya-eng*. Run nine miles. Course E. S. E. The banks were high and our temporary hut in a pretty cleared space, cheerful, and I am thankful to say, free of mosquitoes. The village is some way inland, through a pretty wood. Shot a specimen of that beautiful bird *Psilorhinus Sinensis*. There were three of them, and I have never seen them so bold. Generally this bird is as difficult to approach as our Magpie in England. *Psilorhinus flavirostris*, which is the well known "blue Magpie" of Darjeeling, has a chatter precisely like that of the British Magpie ; while its congener *Sinensis*, which scarcely differs from the other in plumage, has a soft wailing whistle like the note of some birds of prey.

*February 4th.*—Thick fog at 7 A. M. and Thermometer  $64^{\circ}$ . Took a stroll inland with my gun, but saw nothing new. The country is a thin forest of "Eng" trees (a species of *Dipterocarpus* very like the Saul) and here and there swampy patches. *Kyá-eng*, Latitude  $16^{\circ} 1' 49''$  N. ; Longitude  $98^{\circ} 6' 30''$  E.

*February 5th.*—Left at 9 A. M. and about seven miles up the stream lost the last traces of the tide. It thus ascends in the springs by

computation sixty-nine miles. I could not find out the site of old Zummee, a fort or stockade from which the river takes its name, and which in Captain O'Brien's map is placed somewhere here. The Talyngs and Karens would not, or could not, tell me. These people seldom speak the truth, when questioned respecting the country they live in. The Karens especially are the most annoying in this respect, but whether they mislead purposely, or from sheer stupidity, is a question most difficult to determine. At 11.30 A. M. came to for a meridian Observation. Left again at 25m. P. M. At 2 P. M. we passed the first scour or rapid. The banks still muddy: but shingly bottom at intervals. At 3h. 30m. P. M. reached *Kapá*, a little Karen settlement of two houses. Some children were squatting down, looking at the wonders coming on shore from the boats. They, both boys and girls, were very pretty and interesting, and clothed in long shirts, like the calico night shirts little boys used to be clad in when put to bed. Great numbers of *Carpophaga Sylvatica* (the "imperial pigeon" of Moulmein) flying about. We shot five: a great addition to our dinner, for these birds are of excellent flavor. To-day's course S. S. E., run sixteen miles.

*February 6th.*—Thermometer 64° at 7 A. M. Hot and muggy to the feel. *Kapá*, Latitude 15° 53' 13" N.; Longitude 98° 12' E.

Remarked two very fine Gaur skins belonging to a Mooksho or hunter, who had killed them on the Wenyou river, and left them here, together with a heap of horribly offensive barbecued meat for sale. The Karens especially delectate in this kind of carrion.

Weighed at 1h. 30m. P. M. River winding and stream strong and shallow in parts. It is now very clear, but mud has not entirely disappeared. Saw some monstrous limestone rocks about fifteen or twenty miles to the westward. They proved to be the "*Alanteya*," a range on the east bank of the Wenyou, and must be above two thousand feet in height. Reached *Shanzoo* at 4h. 35m. P. M.; run nine miles; course S. by E.

Shanzoo or Nyoung Zummee is a pretty cleared spot, with a few very neat houses, pleasantly shaded by large peepul trees, and overlooking the stream from a high retired bank. The village is peopled by a colony of Shans from Kyouk-houng to the Southward, an intelligent and interesting people. The community had formed

a really valuable and carefully tended garden or orchard, about four acres in area, and well stocked with plantains, jacks, mangoes, limes or oranges, chillies, and cotton. Of the last however the chief cultivation was round the village. These Shans have a singular appearance, from their shaving their heads all but the vertex, on which the hair is allowed to grow in a patch to about two inches in length, so that each man looks as if he had ornamented himself with a shoe brush, on the top of his skull. There were several Hoolocks (*Hylobatis lar*) dark colored Lungoors (*Presbytes Phayrei*) and large squirrels (*Sciurus bicolor*) on the huge trees over our heads; the branches of which were also crowded with different species of the *Treron* (green pigeons), *Carpophaga Sylvatica*, and one or two large hornbills (*Buceros Cavatus*). They had all become so familiar with the presence of men (in the shape of the quiet peaceable Shans) that it was not till after several shots from our ruthless guns that the animals, both bird and beast, departed to safer precincts. The air has been close and oppressive, and we had some thunder and lightning at night.

*February 7th.*—Nyoung Zummee. Latitude  $15^{\circ} 48' 46''$  N.; Longitude  $98^{\circ} 13' 15''$  E.

We started at 25m. P. M. The river very picturesque, from its high wooded banks and clear rippling stream. We met fewer rapids or scours than yesterday, and occasionally reaches of very deep and tranquil water. At 4h. 35m. P. M. arrived at Thaláya Zy'k. Course S. by E.; run ten miles.

This spot we found to be a mere landing place on the east bank, from whence a path leads to the wretched scattered hamlets of the Karéns a mile or so inland. We took up our quarters in a bamboo zeyat which the Goung Gyoup or Tahsildar of the division (who accompanied us) had caused to be furbished up for our use, in a partially cleared space of some forty yards diameter, surrounded by dense thickets and forest. The spot was some fifty or sixty feet above the river which forms here a beautiful deep pool, full of fine fish, which sport here quite unheeded by the Karéns, who prefer this food in the half salted, half putrid state, in which it is sold in the Moulmein markets. The truth I suspect is, they are too indolent to be at the trouble of catching them.

This spot ended our voyage. The river is navigable further up for such boats as ours: but so many rapids occur that progress is very tedious. Our journey onwards is by land on elephants, of which we found a considerable assemblage, with their motley wild-looking drivers, all Karéns from neighbouring settlements.

When young, these people are by no means bad looking. Some boys we remarked amongst them to-day were quite pretty, but the Mongolian roundness of their faces, which in youth gives an innocent and pleasing air, imparts an inane heavy expression in after years. And the filthy practice of chewing pawn is carried by them (from the earliest age) to such an extent, as to be absolutely odious. Few reach maturity with more than blackened stumps instead of teeth in their gums (from the corrosive nature of the lime mixed with the pawn) and at all hours, at all ages, and with both sexes, the reddened saliva may be seen running out of their disfigured lips, or discharged in incredible quantities from their mouths. The teeth become at first permanently red, and by the age of twenty permanently black, so that the prettiest girl of the tribe when she smiles is changed into a very gorgon. All of them, big and little were furnished with pipes, made out of the curved roots of bamboos with a reed mouth-piece; and when not chewing pawn, they were smoking these. The tobacco they use is grown by themselves on the river banks, and is mild and rather flavourless; but they preferred it to my "honey dew" and "solace."

The dress of the Karéns consists of a long night-shirt looking garment, into the loose sleeves of which both arms or only one (as convenient) can be thrust. The hair they wear long, and bound into a knot on the top of the head, perhaps a little on one side to look rakish. Over the shoulder is hung their invariable travelling bag of stout cotton cloth, white, red, or striped. And in the hand is generally carried the *dâ* (an awkward lumbering implement half knife, half chopper) which like the Lepchas of Sikkim, the Niwars of Nepal, or the Bhotias of Tibet, they apply to all imaginable uses. A few of them, wear large mis-shapen turbans, and one man a Saukay, or patriarch, was dressed out in a Burmese shaped *engce* (a short shirt coat) of good English superfine blue broad cloth, garnished with the name, in gold letters, of the firm whence it had

emanated, conspicuously placed in front of his raiment, like the most noble order of the Tower and Sword.

It would encroach too much on my limits to give more than an introductory sketch of these people, whose history moreover has been already presented to the world by abler writers than myself. I will only remark that the Karéns we have now to travel with locate themselves along the Zummee river in clearings, which they quit after every two or three years. They are less civilized than the Karéns of the neighbouring Hougthrau river, and although the latter stream is not more than twenty miles distant, they seldom visit it. The Karéns on the Hougthrau possess buffaloes and poultry. Those of the Zummee nothing of the kind, subsisting solely upon a vegetable diet which consists not only of rice and the usual orchard produce, but of jungle fruits, roots, leaves, and even bark, substances which one would suppose nothing but a famished monkey or squirrel would turn to for aliment. To this may sometimes be added a scrap of dry salt fish or barbecued meat obtained by barter from some Moulmein trading boat. The animals, birds, and fishes with which their forests and streams are stocked, they seem neither to make use of, nor notice. They have neither fire-arms nor bows and arrows, nor fishing implements.

In singular contradistinction to such traits of destitution is the fact of their wealth in elephants. Every householder appears to possess one if not two of these animals. They are brought chiefly from the Shan territories: but how these people procure the money to purchase them I never could clearly discover. Many are stolen no doubt. The animals are generally small, valuing at from two to four hundred rupees. They carry little more than what would load a good up-country bullock in India, and from want of proper training are wretchedly slow.

From Thalayá Zyk, a path extends in a north-east direction to Meetan, a large Karén village on the Hougthrau distant two days' journey. There is no direct access to that river from any point further south on the Zummee, owing to intervening ranges and masses of limestone rocks, which are utterly impassable. These extend as far south as Thoon zoo (Lat.  $15^{\circ} 19'$ ) where they can be, in military parlance, turned. Our course then lies along their western border to that place, and thence north-eastward.



In the evening wandering gun in hand, I was fortunate enough to shoot an entirely new (undescribed) species of wood partridge (*Arboricola*). It was running so fast down a small hill that I took it at first for a rat or some such animal.

*February 8th.*—Halted—all our elephants not having assembled. Took Observation at noon, and made Thalaya Zyk Latitude  $15^{\circ} 43' 16''$  N. and Longitude  $98^{\circ} 15'$  E.

The heat in our little bungalow was frightful. The people of this country thatch with the sole view apparently of keeping out rain, not sun. We tried to make matters bearable by heaping boughs overhead. In the evening saw a specimen of that superb bird *Eurostopodus cerviniceps* high in the air. It has much the flight of our fern owl or goat sucker, but on a grander scale.

*February 9th.*—Started at 6h. 45m. A. M. and walked till 10 through dark scrubby jungles, affording cover for any amount of wild beasts: but saw nothing out of the common way, except two or three wood partridges, one of which I shot. Hills were perceptible through the jungles to the eastward. Our course seemed S. E. At 10, mounted my elephant and at 11h. 20m. reached Py'ngwen, distance about ten miles. Our encamping place was in a low dell near the Meetaget river, in jungle so close and dark that it seemed twilight all day. The Karens are very expeditious in clearing and felling, and in running up the little booths in which we eat and sleep, and lucky it is for us they are so, for with houses we have now done. About a mile from our resting place is a Karen clearing, stocked with plantains, some cotton and two or three half dilapidated huts, utterly uninhabitable to us from their filth. The *Meetaget* runs through forests at one time abundantly stocked with teak trees, which have now, however, been nearly all felled and taken away to Moulmein. The clear rippling waters of these brooks gave us a most delicious bath after the heat of the day's journey.

*February 10th.*—Our march to-day was to *Meepra*, on a branch of the *Meetaget*. Latitude  $15^{\circ} 37' 5''$  N. and Longitude  $98^{\circ} 17'$  E. Course S. W. through dreary and dark jungles; distance about eight miles. Some Karen women and girls came to see us from their clearing about a mile off. One of them was remarkably pretty and seemed to know it.

*February 11th.*—Left at 6h. 45m. A. M. Course S. E. by S. distance eight miles to Poonkhau. Latitude  $15^{\circ} 32' 58''$  N.; Longitude  $98^{\circ} 20'$  E. It is a picturesque little clearing with one or two houses on the junction of the *Kyoon* and *Meetaget*. Here we had breakfast, and after taking a meridian observation left at 25m. P. M. and reached *Meetabwee* at 2h. 45m. Distance about seven miles S. S. E. The march lay through a dense forest and along the roots and spurs of a chain of limestone rocks which ran along to our Eastward in a vast wall, with a fantastic castellated ridge, shooting up to 2,000 and 2,500 feet. This is part of the great barrier between the Zummee and Hounghthrau, which I have already alluded to. But it is only during this march that it comes skirting the road so near, and shows itself in its vast proportions. We encamped in a most romantic dell, close to the rocks. At night I heard singularly wild and to me new cries from the direction of the latter: but strange to say, nothing of interest in Zoology has yet been met with, except perhaps to-day, when we captured a most beautiful snake which had climbed up a bush. It was black, banded with zigzags of bright vermillion, with drops in the interspaces of pure white. It was harmless, having teeth along the maxillary or upper jaw bones.

*February 12th.*—Left at 6h. 40m. A. M. We have descended sensibly and left the dry stony jungle for a rich moist soil, the nullahs (small streams) we cross being muddy and boggy. Our course was S. S. E. and Southerly, through profound forests, in some places dark with shade: and always looming over our heads to our left hand (Eastward) the monstrous rocks ran along like an enormous wall. Here and there near swampy places the ground was thickly marked with the traces of deer and pigs; and peafowl were calling all around, but we could see nothing worth shooting! At 10h. 15m. reached *Kroontau*, a spot at the junction of a stream of that name with the *Meykathá*—which comes tumbling in from the Eastward through an interruption or gorge in the limestone wall. The Zummee here therefore ceases, according to the Karéns: but in truth the *Kroontau* is nothing but the *Zummee* followed higher up.

Took Observation at *Kroontau*—Latitude  $15^{\circ} 22' 49''$  N. and Longitude  $98^{\circ} 20' 30''$  E.—and proceeded on our journey. Course

S. S. E. ascending a little into dryer undulating country, through an arid scanty jungle, where the sun beat fiercely. Halted at a nasty spot close to a deep boggy pool, covered with tangle and underwood, near the ruins of an ancient entrenchment or stockade of the Burmans called *Ankanoo*—day's run 17 miles.

Ankanoo appears to have been the furthest Southerly position of the Burman Army, which invaded this Province. The Talyngs fled before their conquerors and took refuge in the Shan states, and in Bangkok the Siamese Capital itself, where they settled and became naturalised, intermarrying with the Shans—most of whom in this direction speak Talyng.

We received here intimation that the Shans (whose territories we are getting near to) had barricaded the only pass into their country—not with hostile intent but from fear of our infecting them all with small-pox, which indeed was then prevalent at Moulmein. I therefore sent off a civil letter to the Governor of the district we had to enter, giving a clean “bill of health,” and intimating that it would be excessively inconvenient for us now to turn back.

*February 13th.*—Marched to Thoonzoo, about five miles E. by S. through a light scattered forest. Passing heedlessly by a pond in the jungle, I suddenly put up a pair of that rare and handsome bird *Anas Melanogaster* (of Blyth, who however I think makes it a *Sarcidiornis*.) It is a noble species of duck, as large as a barnacle, and I felt much chagrined at not having been ready with my gun to secure such a valuable specimen.

In this march we turned the flank of the limestone barrier, which appears now to trend to the Eastward and to break up into innumerable insulated groups of rocks. These unite again to the South of Thoonzoo but lose their mural form, and run in parallel rounded ridges from E. to W., the black bare rocks and the scanty burnt up jungle on them, giving a most dreary appearance to the country. But *Thoonzoo* itself cheers the eye by displaying a tolerable extent of open down—a relief to the senses only to be appreciated by those who have journeyed for days through the monotonous forests of Tenasserim. We stopped here to breakfast; examined a little spring welling out of the grass, round which tiger's foot-prints were numerous; noted the three mounds of stones, or cairns, which

were erected here by Captain (now Lieut.-Colonel) Macleod, to mark the boundary between the British and the Siamese possessions, and which the latter people have now decorated with flags, &c., as places of worship; and after taking an observation started at 1 P. M.

Thoonzoo,  $15^{\circ} 19' 9''$  N. Lat. and  $98^{\circ} 27' 30''$  E. Long.; Ther.  $88^{\circ}$  at noon.

Height by Aneroid above Moulmein 701 feet.

The remainder of our march to-day was the worst we have experienced. Course N. E. by E. and at about two miles entering the district of Kyouk K'houn (Shan States). I rode an elephant. The path lay up and along a prodigiously steep hill, and it was most nervous work proceeding along the face of it, for the track was just the breadth of the animal's foot and no more, and a slip would have been annihilation: but these elephants never do slip—nobody can recollect such an accident having happened, and one speedily gets to feel at ease on places which would make a stranger shudder. After descending this hill, we proceeded along a muddy quaggy nulla, in a deep dark gorge, which was, I think, the worst part of the trip. The unfortunate elephants sunk at nearly every step to their shoulders, and wrenched their bulky bodies out of the tenacious mud and quicksands with wonderful strength and perseverance. To add to our comforts, we were by and bye all brought up in an inextricable mob by the barricade, for the Karéns who had preceded and headed our column, not daring to break it down had waited for our coming up. As evening was approaching and we had a good deal more of the vile quagmire to pass, no time was to be lost, and I commenced yelling at the people to demolish the barrier: but not a soul would attempt it, till I had struggled and squeezed through to the front, where my own Chuprassies and people cleared the obstacle away, and handed me a gubernatorial edict which was discovered suspended over the abbatis "banning and barring" further progress. Beyond this spot we had about two miles more of the boggy stream, in a dense ratan jungle between steep thickly wooded hills, and at length at 5 P. M. we emerged into a pretty cleared spot, shaded by fine timber, in which lay the village of Weytamaryng.

Our little encampment of booths and wigwams was outside the village, and shortly after our arrival the Governor and suite came to visit us. He was a civil good-natured old man, and all the people a simple pleasing set. They are of the class called Shan Talyngs, to whom allusion was made before; and their countenances are far more pleasant than those of the pure Shans, especially as they do not cut their hair into a brush. We had a long interview with the Governor; who, whether it is etiquette with them, or whether he was deaf, or imagined I was, bawled out every word like a stentor. He spoke in Shan, which was interpreted into Talyng, and that into Burmese. Before parting I civilly remarked to the old gentleman that it would be more considerate to travellers to put his cordon sanitaire at the commencement, instead of near the end of a difficult journey! Total march to-day 13 miles.

*February 14th.*—The place being pleasant to look upon, and accounts of the next march most dismal, we halted to-day.

*Weytamyng*, Lat.  $15^{\circ} 20' 31''$  N.; Long.  $98^{\circ} 40'$  E.; Thermometer  $55^{\circ}$  at  $6\frac{1}{2}$  A. M.,  $84^{\circ}$  at noon. Height above Moulmein 524 feet. The extremes of temperature have so disturbed the rate of my Chronometer, that, want of time preventing my stopping long enough anywhere to re-rate it, I must trust to Latitude and dead reckoning to fix my positions in future.

In the evening took a stroll through the village. The houses are large, well raised on bamboos, of which they are entirely composed, and very flat in the pitch of the roof, like Swiss cottages. The houses stood embowered in plantain trees (these people being exclusively frugivorous) and the low spurs of the hills all round were cultivated with cotton. The marks of pigs were so abundant that I was nearly tempted to sit up at night for them. My offer of ten rupees to any villager who would shoot me one was however met with general merriment as something "really too ridiculous"—not a fowl, duck, or buffalo was to be seen, and all the way from Thaláya zyk to the Hounghthrau river, we have to depend on our own commissariat for supplies. Fortunately the possession of a good quantity of Grimwade's desiccated milk, allows us the real luxury of a good cup of tea and coffee in the mornings; no traveller in such inhospitable regions should be without this admirable substitute for

fresh milk. It is the only successful preparation of the kind I have ever met with, but lest I should be suspected of "tawting" for Messrs. Crosse and Blackwell (who sell the commodity) I will sing no more of its praises.

*February 15th.*—We started at 7 A. M. along a dismal bottom between densely wooded hills, threading a nulla—not so horribly boggy as the last. Then up and along a lofty hill and down its Eastern slope across an extent of low hot grass jungle, to Tharawá, a little wretched clearing, where we stopped to breakfast. Course about N. E.; distance eight miles. Latitude  $15^{\circ} 21' 24''$  N. and Longitude  $98^{\circ} 36'$  E.

At 1h. 30m. P. M. we started again, and proceeding N. E. mounted into a fine tableland about 2000 feet above sea level (by Aneroid). At  $5\frac{1}{2}$  P. M. reached *Loongtikoung*, a charming little village of some six houses surrounded by small rounded hills, entirely cleared from jungle, for several acres. It reminded us of a Swiss chalet for the houses of these Shan Talyngs are very Swiss in appearance. The poor people and their pretty but dirty children stared at us in pure astonishment, for we were the first "white mans" they had ever seen. A few kind words, however, soon encouraged them, and presently a couple of sturdy urchins were vying to be foremost in getting Mr. Parish Orchids and other flowers. We found it very cold at night. Thermometer  $58^{\circ}$  at 10 P. M. Our day's run has been about sixteen miles.

*February 16th.*—Thermometer  $52^{\circ}$  at 7 A. M. At 9 A. M. Thermometer  $63^{\circ}$ . Water boiled at  $210^{\circ}.4$  giving 1918 feet above the sea. The Aneroid gave 1929 feet. Took a sketch of the village, and a look at the surrounding country from a neighbouring height. *Lanki p'ha* a remarkable limestone rock close N. of *Thoonzoo* bore W. by S. peeping above the tableland we had crossed yesterday, and the whole Northern horizon was shut in by a tumultuous sea of hills through which the gorge, along which runs the *Meykatha* could be here and there distinguished.

Lat.  $15^{\circ} 23' 34''$  N. Long.  $98^{\circ} 42'$  E. Thermometer at noon  $87^{\circ}$ .

Left *Loongtikoung* at 30m. P. M., course E. N. E., and reached *Mongtoosá* at 2h. 45m. P. M. stopping to rest a little at *Meykatha*, a little hamlet close to the hill stream of that name, the

mouth of which we had seen at Kroontau on the 12th. It was surprisingly large and deep, considering the length of its course, and its beautifully clear waters tempted strongly to a bath. The *Meykatha* comes from near a lofty abrupt mountain which the Karéns pointed out, apparently twenty miles off to the S. S. E. The hill said to be stockaded and the head-quarters of the Governor of *Lengka*, a district we enter to-morrow. It is called by the Burmese "*Lengka tat*" (Lengka fort); by the Shans "*Kho-ya*;" and by the Karéns "*Klong p'hado*" (great hill). At *Mongtoosá* is a small colony of Shan Karéns, who, men and women, sat close round never taking their eyes off us while day-light lasted. Our ablutions and toilettes seemed to excite the most intense astonishment, and an examination of my telescope, sextant, and especially the Chronometer with its solemn tick, set them all wild.

*February 17th.*—Our course this morning lay N. N. E. up and along the ridge of a hill called "T'hee bo" and towards the highest point of the ridge "*Pansanouk*" where the Aneroid stood at 27.1. On the way I had a snap shot at a barking deer and missed. (One of our party more fortunate killed one the other side of Loongtikoung, the venison of which was excellent). A fine polecat looking animal also crossed the path, but too quickly to be fired at, and also a bevy of the *Rollulus cristatus*, a singular genus of quail procurable occasionally at Mergui. Hitherto I have done nothing in the Zoological way myself, and as to the people, they of course do nothing to help one. The ascent up this interminable hill was most fatiguing, and after four hours climbing, I was glad to sit down on the summit where we had another view of the "*Lengka tat*" about thirty miles S. S. E. The rest of our day's march was a steep descent into a hot grass jungle bottom, and at noon we halted at Toongban by a stream for breakfast, having entered a moderately undulating country, buried in heavy grass jungle and thinly scattered forest trees, interspersed with rugged blackened limestone rocks.

After breakfast, before resuming our journey, there was much deliberation and discussion amongst our Karéns, and we were at length given to understand that the path onward was planted with tiger traps: things about as unpleasant to meet as the animals them-

selves. Our order of march was therefore thus. The most experienced of the Karéns, a slow going imperturbable old fellow, led the way with a large bamboo held to his stomach as if he were angling for eels. The object of this manœuvre will be shortly apparent. Immediately behind him protruded the barrels of my Westley Richards, loaded with ball twelve to the pound, and grasped by myself in readiness for all comers. Mr. Parish, also advanced similarly armed, and our rear was covered by a column of clubs, some spears, and one or two antique muskets (probably unloaded). We had not proceeded in this order very far, before we came on a little bamboo rail, placed there to warn the passenger that a trap is close ahead. Our pace then became funereal. Our Karén leader struck his bamboo on the ground at every step, and presently hit the trap, which went off with a crack, driving a sharp pointed bamboo dagger or spear head across the path in a manner which would have smitten the foremost of us hip and thigh, had it not been for the angling apparatus afore mentioned. For about three miles we plodded on in this manner, passing four or five traps, three of which had been let or shot off, one most evidently by a tiger: for we found the bamboo spear-head, covered with blood and unmistakable black and white hairs. These traps [which are, I fancy, of Malay or Chinese origin] are on the principle of the bows set by our "Bagh Mars" in India. A strong stiff bamboo, with a sharpened pointed piece slightly inserted at right angles into one end, is placed horizontally at about two and a half or three feet from the ground, close to and parallel with the path, and the unarmed end firmly lashed to stakes or posts. The free extremity is then bent back and secured in that position in such a manner, that any object moving along the path and pushing before it a line extended across, detaches the fastening of the bent bamboo, which suddenly straightening, drives the spear-head with great force across the path. These spear-heads are smeared with the poisonous juice of the "as'hyk ben" (a large tree) found in the hills (a sample of which I take this opportunity of sending to the Society). At 3h. 30m. we entered a verdant line of forest and found ourselves on the banks of the *Taylo* a beautifully clear hill stream, falling into the *Houngthrau* about ten miles to the North. We



have therefore passed the water-shed between the Meykatha and the Hounghthrau, and may be said to have commenced our journey homeward. We encamped for the night on the banks of the stream, in thin bamboo jungle, and were grievously tormented during our stay by the insupportable stench of a species of Acacious creeper "Soo-bók-ben" like assafoetida: of which there were four or five plants about. The effluvium is so strong as to be plainly perceptible two hundred yards off, but strange to say both Karéns and Talyngs use it to flavour their food! Our march to-day has been fifteen miles. Course N. N. E.

*February 18th.*—There was an alarm last night of a tiger, so that the trumpeting of the elephants, the shouting of the Karéns, and the fragrance of the abovementioned creeper, gave us a charming time of it! At 7 A. M. we were off down the Easterly bank of the *Taylo*, and then along a hot arid grass valley, with rugged limestone rocks in all directions. Several tiger-traps were found here also. This part of the country is said to be full of tigers, and indeed to-day's and yesterday's jungle looked as if made on purpose for them. Nothing could induce the Karéns to follow, with or without me, the tracks from any of the traps which had been let off, to find a wounded animal. The Koles of Singbhoom would have done it in a moment: but the Karéns know nothing of woodcraft. We reached *Taylo*, a small Karén settlement on the banks of the stream it gives its name to, at 11 A. M.—a nine mile march.

Observation at noon, *Taylo*,  $15^{\circ} 36' 2''$  N. and Longitude  $98^{\circ} 47'$  E.; at noon Thermometer  $88^{\circ}$ , at 4 P. M.  $75^{\circ}$ ; Aneroid  $28^{\circ} 15'$

Towards afternoon the sky began to look threatening, and we were obliged to remove ourselves and valuables underneath one of the Karén houses for shelter. To have occupied the house itself was impossible as the floor was of split bamboo which would have let the leg of a chair or table through directly, so we had no resource but to put up in the filth under the house, or get wet through and lie in the rain all night. Karéns' houses are raised about nine feet from the ground, so we did not want for room below: and by dint of diligent brooming and scraping, matting below and around, and ceiling with cloths of all kinds above, we managed to ensconce ourselves pretty well.

*February 19th.*—Left *Taylo* at 7h. 15m. A. M. and reached the Wenkadoung, a small stream, at 10h. 45m. course North Westerly, distance about ten miles. The march was entirely through a dreary waste of burnt up grass, black rocks, and a few scattered trees. Our encampment was on the bank of the stream.

Observation at noon, Lat. 15° 39' 18" N., Long. 98° 36' E. Ther. 88°.

After breakfast proceeded and reached the Lamba, another stream, about eleven miles. Towards the close of the march we entered very dense jungle, and at our halting-place had to cut down and clear away almost solid masses of thickets to make a little room. Last night's wetting has made some of our people ill. The Lamba falls into the Hougthrau about ten miles off to the North East.

*February 20th.*—Marched to the Lynkama, a small stream about eight miles to the North West. The path through a thick shady forest. It appeared full of birds but we are too hurried to admit of proper exploring for specimens. To-day and yesterday we were annoyed during our noon breakfast by countless swarms of bees, drones, and flies of endless variety—especially a small indefatigable bee, of which Mr. Parish and I had presently whole *hives* dangling to our backs, hats, &c. Fortunately they did not sting. At breakfast we were heartily sickened by seeing the Karéns devour the raw bloody body and entrails of a Monkey I had shot. They swallowed the intestines "au naturel" like macaroni. Towering over the trees near us, was a singular rock, like a huge truncated steeple, full 1000 feet high. At 1h. 40m. continued our journey and reached the Meytowáng, another stream [at 4h. 40m. distance six miles] and had a most delicious bath in its crystal waters. On the way I saw a flight of a species of Horn-bill quite new to me, and which I fancied were *Buceros Carinatus*, but there was no getting near them. It is a general idea that birds (and other animals) are tame and unwary in regions where they seldom or never see man: but this is contrary to my experience. They are wildest where they see and *feel* too much of man, as in England, where any tolerably uncommon bird has a shot at him before he can take two hops in any direction. But they are also wildest where they never see man. The ornithological collector must go where he can find a *juste milieu*.

Noon Observation, Lynkama. Lat.  $15^{\circ} 50' 42''$  N.; Longitude  $98^{\circ} 26'$  E.; Thermometer  $88^{\circ}$ . Run to-day fourteen miles; course N.N.W.

*February 21st.*—Started at 7 A. M. in a thick fog travelling through thinly wooded tracts of grass jungle. Came across three of those singular birds *Corydon Sumatranus*. They are as stupid nearly as boobies or noddies. One that I shot at and missed, remained quietly till I loaded again and killed, the other two sitting looking on. We passed some dried up ponds or pools thickly marked with the foot prints of Gaur and Sâmbur. The Karéns say the Gowers resort to these plains in great numbers in October, at the close of the rains. As we neared the *Houngthrau*, the ground rose and afforded us glimpses of the magnificent hills to the Eastward, Nâpullo, Dweepameekwyn and Mogadook, but we soon plunged into thickets of tropical density, and pressed our way through them till we stood on the banks of the *Houngthrau*, a beautiful crystal stream, here about fifty yards wide, and running with considerable force. It was so deep that the elephants were all but floated off in crossing, and I ordered a raft to be made for the Chronometer, which on ordinary occasions is carried suspended to a pole. A steep high bank on the other side brought us into a forest of high trees, and further on a large but much neglected orchard, filled with plantains, jacks, mangoes, and oranges (the last eatable only by a Karén). Passing through this we came to the village of *Meetan*, quite a city after the deserts we had passed through! Our encamping-place was on the right bank of the *Houngthrau*, and we had the satisfaction of seeing our *fleet* ready for us, the rest of our journey being by water. We had the pleasure here of getting our letters, papers, fresh supplies, &c., not having heard from Moulmein since the 2nd; and the grand luxury of fresh eggs and milk.

*Meetan* contains about fifty houses of Karéns and a considerable deal of cultivation. It is the highest point generally which trading boats from Moulmein reach. They bring up dried fish and such condiments as the Karéns use, also cloth, beads, crockery, glasses, &c., which they barter for hill rice, tobacco, cotton, wax, &c. Smaller boats can ascend a couple of days' journey further, to a place called Kozey Ko Gewn (the ninety-nine islands) where they extend

their traffic to the Shans. I was much disappointed in not seeing this singular place, where the stream is split into numerous channels by small islets, but the Karéns, whether from design or stupidity it is hard to say, brought me past it, and it was now too late to retrace my steps two days up the river. Journey to-day ten miles, N. N. W.

*February 22nd.*—Took Meridian Observation, Latitude  $16^{\circ} 1' 1''$  N.; Longitude  $98^{\circ} 23' E.$ ; Ther.  $90^{\circ}$ .

At 40m. P. M. we got on board the fleet, and went merrily down the pure waters of the Hounghthrau. Our boats are mere canoes calculated to pass over the shallows and scours of the stream, and propelled by two paddles forward and one astern to steer, the motion of paddling is smooth and pleasant, and with an awning of leaves and mats overhead, we glided down the stream in great luxury at a rate of six to eight miles an hour. On approaching rocks, narrows, or rapids the bow paddle man stood up, and with a light bamboo in his hand fended us cleverly off the rocks as the current swept us swiftly past them. Now and then as the reach of the river turned to the East, magnificent mountains met the view. At others, the eye swept up long vistas of graceful trees bending over the stream, or perpendicular banks and rocks thirty to forty feet high, past which the glassy waves rushed hurriedly, or spreading into pools, eddied gently along, so pellucid that the pebbles at five or six feet depth were distinctly visible. In fact a more delightful way of travelling than this cannot be devised. We reached the mouth of the Kyik, a hill stream running in from the Eastward at  $\frac{1}{2}$  past 4 P. M. and encamped on the banks for the night. The weather looked threatening again, so had the roof of our wigwam double matted and sloped down as much as possible and made all as snug as we could against a bad night.

*February 23rd.*—Towards morning the rain commenced, and in spite of all precautions the roof began to leak pitilessly, and we had to turn out, roll up bedding, and stow every thing away into the smallest compass. It had been our intention to start for Mooley-it—a celebrated peak about thirty miles to the North East—to-day, and endeavour by forced marches to reach it in two days: but the rain forbad all hope of travelling on elephants through the jungle, and as Mr. Parish's leave had nearly expired, he could not afford

to wait for the weather clearing up, and proceeded at once towards Moulmein. This was a most mortifying conclusion to our journey: for Mooley-it is in fact the only object of much interest in the country: and moreover we lost the benefit of his botanical knowledge in the very place where it would have been the most advantageously exercised.

The sun has approached the zenith too nearly now to allow of a Meridian Observation in the artificial horizon, so took the latitude by 2 P. M. altitudes and made it  $16^{\circ} 8' 58''$  N., and Longitude by Acct.  $98^{\circ} 12' 30''$  E.; Thermometer  $85^{\circ}$  at 1 P. M., at 9.30 A. M.  $78^{\circ}$ . Aneroid 30.1.

*February 24th.*—Determined to pay Mooley-it, a second visit (I had been there in February, 1855,) to verify its altitude by boiling water, my first observation having been made with inferior apparatus. Set off at 7 A. M. crossing the Kyik rivulet, through a flat forest for four miles to the Karén village of Kyik, a mile beyond which we began the ascent of the Kyik hills, a range leading to the Mooley-it mountain. It was severe labour at first, being up through Karén clearings on which the sun blazed without the grateful intervention of foliage. By 12 o'clock I was quite knocked up and mounted my elephant, and at 1 P. M. we reached Teewap'hado ("water and great bamboos"), the altitude of which I made by the Aneroid to be 1236 above Kyik. The air was here sensibly cooler and more bracing. Thermometer at 1 P. M.  $83^{\circ}$  our encampment was in a hollow on the hill side, where trickled a small rill, which our numerous elephants and their unruly drivers soon rendered filthy. The thick forest shut out the view: but by occasional glimpses I could see we had been journeying along a narrow ridge, which ascended the whole way, and still kept ascending ahead of us. To our feet both Northward and Southward ran parallel ridges at a distance of about three miles. The whole buried under dense jungle and enormous trees. The path we came by was a mere track, requiring in places great caution in the elephants: and walking on foot was most irksome by reason of the ground being thickly strewn with dead leaves, whose glazed surfaces made it abominably slippery and added infinitely to the toil of the ascent—distance eleven miles.

*February 25th.*—Off at 6h. 45m. A. M. and walked slowly, gun in

hand till 11½ A. M. resting at several places as the ascent was continuous, terribly slippery, and the path choked up incessantly by fallen trees. At 11½ A. M. mounted my elephant, but it was fatiguing and nervous work : for the poor animal could scarcely have gone a mile an hour, and the ascents and descents over slabs of rock, &c. were so steep that he had to go at times entirely on his knees and elbows. We stopped at *Thembauley*, a pretty little cleared spot on the ridge, where the people had built one or two small pagodas, and from hence had a magnificent view of Mooley-it and its neighbour Napulloo, now distant about twelve miles. The Aneroid stood at 25° 25' (far out of the table drawn up for it). 1 P. M. Ther. 78°. From this spot I walked on to Theethoungplee, about three miles along the ridge and descending the whole way, and here we bivouacked at 3 P. M.—distance about twelve miles.

While brushing through the jungle, near Thembauley, one of my people, following with a sparè gun, uttered a sudden cry of pain, and turning round I saw him writhing in such a way that I felt sure a scorpion had stung him. In about two minutes he was prostrate and groaning with torture. The Karéns seemed to know or guess what had happened, for they commenced an eager search in the offending bush, and presently pointed out to me a rectangular shaped green caterpillar, with a back bristling with star-headed spines. This they seized between two twigs smashed all to pieces, and rubbed upon the spot where the man had been stung. In two or three minutes the pain ceased and he continued his journey! I have myself been stung by these little urticarious abominations : but this one must have been of a peculiarly malignant species.

At night we had thunder and lightning and a little rain.

*February 26th.*—Halted to allow some expected supplies to come up. Boiled water at 9 A. M. at 205°. 2; Ther. 71°; giving 3746 feet altitude. Thembauley is about 4000 feet. The Aneroid is quite useless at this height and its reading worked out by La Place's formula gave something outrageous. Thermometer at 7 A. M. 63°.

*February 27th.*—Started at 7 A. M.; Ther. 60°. Path pretty good, level and descending by turns for three miles, then ascending for four more to "Teemeebong" ("yellow sand"), a little partially cleared dell full of bees and gad-flies and a most abominably offensive

species of underwood, *Oloaca seu Stercus olens*, worse actually than the "Soo bôk ben" of evil memory, which had regaled us on the Taylo. Here I had breakfast. Aneroid 24° 6. Thermometer 71° at noon. At 2 P. M. continued our journey and reached the foot of Mooley-it, after going through a belt of small reed or cane-like bamboos, at 4½ P. M.—distance four miles. It was thundering, and looking dreary in the dark hollow, and overhead the clouds were scudding past the peak. So hoping to get above the level of the threatening rain, pushed on, on foot, and after a steep ascent reached the plateau of Mooley-it at 5 P. M. It was hazy and bitterly cold, but so charming to see an open down like a Cumberland "fell" after the monotonous jungle, that I ran about in extasies, to the amazement of my retinue. Ther. 51° at sun-set. They had made me up a snug little hut or booth under the lee of some dense copse-wood which sheltered our encampment from the driving mist and bitter wind, and it only wanted a congenial companion to make everything perfect.

*February 28th.*—6 A. M. Ther. 51. The open down or upland which forms the plateau of Mooley-it is about six or eight acres in extent. It is covered with a short harsh grass, the soil every where trodden and pitted by Gaur's feet.\* Over this are scattered little insulated patches of rocks (granite) and stunted shrubs, among which the Botân tea (a species of *Cumellia*) and a showy white Rhododendron were most conspicuous. This open space, everywhere undulating, slopes down to the East, and after a descent of three or four hundred feet is met by the jungle. Up its steep western face we had ascended yesterday. To the North it appeared extended in a jungly ridge at right angles to the one we had journeyed along, and to the South, out of a belt of dense copse-wood (very like the Cape bush jungle), rose the peak of Mooley-it, a bare granite dome, about five hundred feet higher than the plateau. Though the situation of the plateau is beautiful, its area is too limited for a Sanitarium, and moreover water is scanty and has to be brought up a toilsome ascent of some five hundred feet from

\* These animals come up from the valleys in great numbers during the rains, to graze on this upland: secure during that inclement season, in the unbroken solitude of the mountain.

the jungle on the Eastern face. At 1.30 P. M. water boiled at 200.4. Ther.  $66^{\circ} 5$  ( $86^{\circ}$  at Moulmein); giving 6676 feet above that place. Took 2 P. M. altitudes,  $\odot$ , for Latitude, and made it  $16^{\circ} 12' 53''$  N.; Longitude by Acct.  $98^{\circ} 42'$  E.

At  $2\frac{1}{2}$  P. M. went up to the peak, the awful grandeur of which was scarcely less impressive at this second visit, than at the first. The path from my encampment lay South, through the thick copse, then emerged into an open ridge, being the edge of the summit of a vast bulging wall of bare granite that to the West sloped downwards indefinitely, its base being hidden by its own convexity. This isthmus led about two hundred yards south, and then rose up into a cone of bare granite, on the summit of which the indefatigably zealous Buddhists had erected years ago two small pagodas. I have been in the Himala both at Darjeling and in Nepal, and also on Table Mountain, but have seen nothing approaching the tremendous sublimity of this most singular pinnacle. It is, to East, South and West, a nearly symmetrical dome, perfectly bare and smooth, saving where here and there a boulder juts out, as if about to plunge into the abyss below. The convexity of the dome conceals three-fourths of its depth, so that the eye glances from its outline at once as it were into infinity; and this gives an impression of immensity which actual measurement does not realize. Below our feet a rolling sea of white mist concealed the further side of the near valleys: but beyond and above these the air was clear, and tier upon tier of vast mountainous ridges lay sharply defined before us. To the South the bluff precipices of Napulloo,\*—a mountain the superstitious Karéns dare not tread,—confronted us; while, sweeping round by the East to North East, the ranges of Dweepa Meekwyn, beyond, that of Mogadook, and beyond, that of Pynkloong, each rising higher, up to probably nine thousand feet, closed up the horizon like a tumultuous sea. From between these ranges, along the valleys, dim in the far depths, ran the streams of the Meeklan, and Meetan,† to the Hounghtrau South West; and the Meekla to the Thoungyen North East, with their countless tributaries, all radiating away from

\* The name is compounded of “nat” and “biloo,” spirits and demons.

† Mee or Mey is the Shan or Siamese for a small river, and Meynâm for a large river.



this great water-shed. To the North East the above ranges sink into a wild expanse of flat jungle, concealing the Thoungyen, and bounded by the distant Hills of Yahyn in the Shan territories. To North and North West we looked along a chaos of mountain tops, vanishing into distant haze, and forming in fact the great back bone or range which continues from the Yomadoung of Burma proper; and to the West we traced the ridge we had traversed, and the valleys of the Kyik and Teepoo Shanley. The whole of this vast expanse was one sheet of jungle: one sea of thick umbrageous forest: save where a land-slip here and there exposed a patch of red soil on the mountain side, and where the grassy plateau of Mooley-it itself lay smiling at our feet. These mountains are utterly uninhabited, and except in one direction, [between Lampha on the HOUNGTHRAU, and MYAWADEE on the THOUNGYEN] never traversed or visited by human being. The Karén hunters confine themselves to the spurs next the HOUNGTHRAU—Mooley-it itself is a place of pilgrimage, and beyond it, as far as the Thoungyen river, is an unknown blank.

At 3 P. M. Ther. 68°. Water boiled at 199.6. Ther. at Moulmein 88°. Difference of altitude 7171 feet. The aneroid 23.105. Took the bearings of the principal mountains, and a rough sketch of the sublime view. Amused ourselves rolling huge stones down into the abyss, and by sunset returned to our encampment.

The boiling point in the above observations was obtained from repeated violent ebullitions and carefully noted. The Thermometer, an instrument graduated to .04" was immersed in a tall narrow pot up to as far nearly as the mercury would rise; no lid, and steam allowed ready egress. Finally the error of the Thermometer was fixed from numerous observations made at Moulmein and at Amherst (sea level). The Tables from which the results are worked, are computed from formula given in Bourne's Treatise on the Steam Engine.

In 1854-55, when trying the altitude of Mooley-it, I placed the Thermometer in an open wide-mouthed pot, to the depth of about five inches. The mercury had therefore to ascend a considerable portion of tube exposed to the colder draughts of air. It did not therefore rise to more than 198.8, which with a mean temperature

of 73°. 3' gave 7571 feet for the altitude, and by Tredgold's formula 7479. Being respectively 400 and 308 feet too much.

On the 1st March, I left this interesting spot, and on the 7th reached Moulmein, travelling from Kyik Khyoungwa ("Kyik river mouth") by water. The route as follows :

|                       |           |                     |
|-----------------------|-----------|---------------------|
| Kyik Khyoung to Asoon | 30 miles. | } Hcungthrau river. |
| " Kyaeng              | 30 "      |                     |
| " Migaloon            | 14 "      |                     |
| " Gying               | 10 "      | } Gying river.      |
| " Damatha             | 18 "      |                     |
| " Moulmein            | 12 "      |                     |

*Descriptions of some birds procured in the Tenasserim forests and believed to be new species.—The skins forwarded to the Asiatic Society.*

1. *Strigidae—Ketupinæ—PTILOSKELOS\** AMHERSTII.† (Genus et species mihi.)

Specimen. A nestling—sex not distinguishable.

*Dimensions.* Length 1' 3 $\frac{1}{3}$ ." Wing 10 $\frac{1}{2}$ ." Tarsus 1 $\frac{3}{4}$  Femur 4 $\frac{1}{4}$ . Bill 1 $\frac{1}{8}$ ." 3.

*Details.* As far as developed, similar to those of KETUPA, but tarsus short, as in BUBO, and covered with plumes to the foot, inclusive of the 1st phalanges of the toes. Egrets.

*Color.* Iris sepia (a marked difference from all the known *Buboninae* or *Ketupinæ*, which have the iris yellow). Bill and feet pale flesh color, latter with a yellowish tinge; claws blackish, horny. Head, neck and body, including scapularies and wing-coverts, dirty white, tinged more or less deeply with orange-tawny. Each feather marked near its end with an arrow-headed bar of sepia. Head and nape with spots of the same. On the breast these marks take the form of wide broken bars, lapping round the neck. Wing-coverts also irregularly barred. All this plumage is immature and deciduous: but the remiges (which usually at once assume the permanent coloring) are ashy sepia, barred broadly and softly with full sepia, with marbled interspaces. Downy plumes of legs white.

\* (πτίλον, a soft feather, and σκελος, a leg.)

† HUBUA ORIENTALIS, (Horsfield), *juv.*, vide p. 411 ante. *Cur. As. Soc.*

The aberration from KETUPA proper in this bird is an important one, as it argues difference of habits. The KETUPA, with its lengthened and nude tarsi, is known to plunge down upon shallow marshy bottoms, or into liquid mud up to its knees, and stand or take a few steps about such localities, in search of small Snakes, water Efts,\* or fish. Whereas the true horned Owls, BUBO, ASIO and EPHIALTES, with their long femora and short tarsi, snatch their prey from its perch, or from the surface of water, without wetting or soiling the plumose covering of their legs. The PTILOSKELOS is therefore probably a partly terrestrial bird, as its blunt *Ketupine* claws indicate: but restricts itself to dry spots and is consequently not piscivorous.

The nestling here described was brought from the island of Be-loogewn and died shortly after. I have hitherto failed in procuring the old birds, from whom of course more satisfactory deductions could be drawn. But in answer to any argument ascribing the mixed nature of this bird to immaturity, I must bring forward the fact that both feathered and naked legged Owls show their several conditions in that respect, as soon as hatched. I have picked a young EPHIALTES out of the egg, and found its legs and toes covered with well developed setæ. On the other hand, I have reared two nestlings of KETUPA JAVANICA, and their legs were perfectly bare from the first. The dark iris may not perhaps be so good a distinctive generic trait: for I have observed the color of this organ to vary in EPHIALTES from pale yellow, to orange, and sepia also.

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2. *Sphenuridæ*—MIXORNIS (Hodgson) OLIVACEUS (mihi).† Spec. male. Woods of Teewap'hado, 1100 to 1500 feet. February 24th, 1859.

*Dimensions.* Length  $5\frac{1}{2}$ ". Wing  $2\frac{1}{8}$ ". Tail  $2\frac{1}{16}$ ". Bill  $\frac{1}{2}$ ". Tarsus 1". M. toe  $\frac{11}{16}$ ".

*Details.* Typical. But it carries a straighter and better raised tail than the type M. CHLORIS. Which gives it a more *Sylvian* than *Timalian* look.

*Color, M. and F.* Iris blood red-brown. Bill horny with dusky culmen. Legs and claws fleshy horn. All upper parts reddish olive brown. Wing and tail quills burnt umbre-brown, edge reddish. Fron-

\* I know of no *Salamandridæ* in these regions. *Cur. As. Soc.*

† PELLORNIIUM TICKELLI, Bl., *ante*, p. 414.

tals and face paler and tinged fulvous. All lower parts from chin, clear pale fulvous, mesially albescent, except on breast.

Not uncommon in the hill-forests, frequenting bamboos and underwood; manners active and restless: silent.

3. *Sphenuridæ*—TURDINUS (Blyth) GUTTATUS (mihi). Spec. female. March 2nd, 1859. Woods near Theethoungplee. 3000 ft.

*Dimensions.* Length  $6\frac{5}{16}$ ". Wing  $2\frac{1}{16}$ ". Tail  $2\frac{1}{8}$ ". Bill  $\frac{1}{16}$ ". Tarsus  $1\frac{1}{16}$ ". M. toe  $\frac{3}{4}$ ".

*Details.* Typical. (See Appendix to Blyth's report for December meeting 1842. Continued from Vol. XII, p. 1011, Journal As. Soc.) Plumage of front, lores, and chin stiff and setaceous: but rictal bristles not much developed.

*Color. Fem.* Iris sepia. Lids nude and dull smalt. Bill horny, dark on culmen, pale and livid on crura. Legs horny, claws pale. Crown and upper parts rich vinous olive-brown, brightening to full vinous, rusty on upper tail-coverts and outer webs of remiges. Tail as back, obscurely barred blackish. Feathers of crown edged black, a few pale spots on sides of occiput. Frontals ash, striated black. Auriculars dusky, bounded beneath by a white line, which joins a patch of white on ramus continued to bill. Chin and throat pure white, separated from ramus by a black line which spreads into a patch on side of throat. From top of eye down sides of neck and across upper back a space of acuminate, black-edged, white feathers. All underparts from throat rich orange rusty, deepening into vinous brown on vent.

I shot a pair of these birds on the date mentioned above: but could not find the male. It was however exactly similar to the female, and as they allowed close approach, I could easily remark the plumage. Habits active—Scandent (as in MEGALURUS, &c). Lurking in dense thickets. Voice a low grating chatter.

This is the third new species of the genus I have discovered in Tenasserim. The other two were sent by me to the Society (through Mr. Blyth) in 1855, and named by that gentleman T. BREVICAUDATUS and T. CRISPIFRONS. The latter species with its large tail is rather an aberrant form, if retainable in the genus.

4. *Corvidæ—Garrulacinæ.*

SIBIA (Hodgson) PICATA (mihi.)\*

Spec. male. February 28th, 1859. Plateau of Mooley-it. 6600 ft.

*Dimensions.* Length  $8\frac{3}{4}$ ". Wing  $3\frac{1}{2}$ ". Tail  $4\frac{1}{16}$ ". Bill  $\frac{1}{16}$ ". Tarsus  $1\frac{1}{8}$ ".M. toe  $\frac{5}{8}$ ".

*Details.* Typical. The tail less developed than in *S. PICAOIDES*, which in other respects it closely resembles more so than it does *S. CAPISTRATA*.†

*Color.* M. Iris blood-red brown. Bill black. Legs horny brown. Head and cheeks coal black with greenish gloss, diluting into intense vinous soot-color on back, and that again into ashy soot on upper tail-coverts. Wings soot, shining a little with indigo. Tail centre pair of feathers as back but paler, the rest blacker, obscurely barred darker, and tipped white, more and more so to external feather which is half black half white. Mere chin black, all from thence downwards milk white.

Evidently exceedingly rare, or confined to elevated peaks. A pair only seen, of which the male was secured. Lively and restless, with a prattling whistle like *S. CAPISTRATA*. Incessantly hopping and flitting about the stunted trees found at that altitude (6600 ft.).

This adds, I believe, a fourth to the known species of this genus.

5. *Merulidæ—Saxicolinæ.*

RUTICILLA (Brehm) ATROCÆRULEA (mihi).‡

Spec. Male. February 28th, 1859. Eastern slope of Mooley-it. About 5500 feet.

*Dimensions.* Length 7". Wing  $3\frac{1}{16}$ ". Tail  $2\frac{3}{4}$ ". Bill  $\frac{5}{8}$ ". Tarsus  $1\frac{1}{16}$ ". M. toe  $\frac{3}{4}$ ".

*Details.* Typical. Outline identical with *R. FRONTALIS*.

*Color.* M. Iris sepia. Bill and legs black, plumage ashy black all over. Frontals dull snalt, extending in a line over eye. Nareals, rictals, and all round close to bill velvet black. Obscure tinges of

\* *S. MELANOLEUCA*, p. 413, *ante*. *Cur. As. Soc.*

† So far as I can perceive, it differs from *S. CAPISTRATA* and *S. GRACILIS* only in colouring. *Cur. As. Soc.*

‡ *Muscisylvia* and since *Myiomela leucura*, Hodgson, *vide* p. 416, *ante*. *Cur. As. Soc.*

smalt here and there on upper parts and on each side of breast, at point of the wings (carpal angle) a small patch of rust colour: being the edges of 2 or 3 feathers. Point of wing pale smalt. Small coverts blackish indigo. Largest coverts brown black, tipt ferruginous. Remiges black edged grey. Upper tail coverts washed with smalt. Tail black. The rectrices between the centre and outer pair have their basal half outer webs white, extending more and more towards centre. Belly and under tail-coverts fringed white.

The only specimen seen, sitting on the skirt of a dense thicket, close to a small blind brook. Quiet and still, without the vibratile motion of the tail habitual to all the known Redstarts. But in its conformation, it is undoubtedly a Redstart.

#### 6. *Pycnonotidæ*.

*PYCNONOTUS* (Kuhl) *NANUS* (mihi).\*

Spec. male. March 2nd, 1859. Near Teethoungplee, 3000 feet.

*Dimensions.* Length  $5\frac{5}{16}$ . Wing  $2\frac{3}{8}$ . Tail  $2\frac{1}{4}$ . Bill  $\frac{7}{16}$ . Tarsus  $\frac{5}{8}$ .

M. toe  $\frac{3}{8}$ .

*Details.* Typical. Crested.

*Color.* M. Iris blood red brown. Bill dark horn. Legs reddish horn. Upper parts, including a blunt crest, ashy brown. Each feather shafted whitish. Remiges and centre pair of rectrices reddish clay brown. Rest of tail, dusky sepia, more and more tipt, white externally. Chin, throat, and all under parts ashy white.

The only one of the species observed. It was shot on a large tree in company with many other small birds.

#### 7. *Tyrannidæ*—*Muscicapinæ*.

*MUSCICAPA* (vera) *PUSILLA* (mihi).†

Spec. male. February, 28th 1859. Plateau of Mooley-it. 6600 feet.

*Dimensions.* Length  $4\frac{1}{8}$ '. Wing  $2\frac{3}{16}$ . Tail  $1\frac{5}{8}$ . Bill  $\frac{5}{16}$ . Tarsus  $\frac{5}{8}$ .

M. toe  $\frac{3}{8}$ .

*Details.* Typical. Legs a trifle shorter than in the type (M. *ATRICAPILLA*).

*Color.* Male Iris sepia. Bill and legs coal black. All upper parts jet black, deepening into intense indigo black on back. A broad

\* *IXULUS STRIATUS*, Bl., p. 413, *ante*.

† *MUSCICAPULA MELANOLEUCA*, Bl.

superciliary band of white passing down sides of neck and nearly surrounding the occiput. Greatest secondary coverts white with black bases, the white extended along outer margins of 3 als. Remiges brown-black. Tail centre pair of feathers black. The others white, deeply tipped black, which extends laterally, till it occupies nearly all the outermost web. All under and anteal parts milk white.

This is one of the smallest known species of true Flycatcher. A pair were flitting from bush to bush, settling generally on the summits. The female, which appeared brown and white, escaped.

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#### 8. *Tyrannidæ—Tyranninæ.*

PHYLLOPNEUSTE (Meyer). Subgen. PHYLLOSCOPUS (Boié) SUPERCILIARIS (mihi).\*

Spec. Sex not noted. February 24th, 1859. Woods of Teewap'hado. 1100 feet.

*Dimensions.* Length  $4\frac{1}{4}$ ". Wing  $1\frac{1}{2}$ ". Tail  $1\frac{2}{3}$ ". Bill  $\frac{3}{8}$ ". Tarsus  $\frac{1}{8}$ ". M. toe  $\frac{5}{16}$ ".

*Details.* Are those of CULICIPETA, (Blyth), but it lacks the mesial light stripe along the crown. If that indeed be a distinction from a Wood-wren that I sent to the Society's museum in 1855, agreeing to my thinking with CULICIPETA TRIVIRGATA, (Temminck). It was named by Mr. Blyth PHYLLOSCOPUS VIRIDIPENNIS (n. sp.),† although it had the coronal stripe prominently. The present subject has a considerably grosser bill than the last named, or than PH. AFFINIS, (mihi); and so wide basally as to be almost *Muscicapine*.

*Color.* Iris sepia. Bill blackish horn, reddish at edges. Legs fleshy horn. Head olive darkened with ash: auriculars paler and greenish. A broad dull white supercilium. Chin and throat white, and all the rest of under-parts pure gamboge-yellow. Upper parts olive-green; pure and yellowish. Remiges and rectrices dusky brown, edged green. Lining of wings sulphur-yellow. Inner webs at ends of three outermost pairs of rectrices margined sand colour.

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#### 9. *Phasianidæ—Perdiciæ.*

ARBORICOLA (Hodgson) CHLOROPUS (mihi).‡

\* ABROENIS SUPERCILIARIS, *ante*, p. 415. *Cur. As. Soc.*

† A true REGULOIDES. *Cur. As. Soc.*

‡ TROPICOPERDIX CHLOROPUS, p. 415, *ante*. *Cur. As. Soc.*

Spec. Female. February 8th, 1859. Thalayá on the Zummee river.

*Dimensions.* Length  $11\frac{5}{8}$ ". Wing  $5\frac{7}{8}$ ". Tail  $2\frac{3}{4}$ ". Bill  $\frac{5}{8}$ ". Tarsus  $1\frac{1}{16}$ ". M. toe  $1\frac{1}{4}$ ".

*Details.* Typical, but, taking *A. TORQUEOLA* as the type, bill slenderer and claws less lengthened.

*Color. M. and F.* Iris hazel, lids red, orbital skin blackish. Bill dull orange red, dark on culmen, yellowish at tip. Legs and claws greenish yellow. Crown, back of neck, and all upper parts, passing round breast, full olive-brown, barred rather largely black.—Wings the same, but on ternals and great coverts the pattern confused, larger, ground color paler, and ashy marblings in interspaces. Secondaries reddish fulvous, mottled darker, and primaries dusky espia, margined rufous. A few rufous bars on tail, at end and laterally. Auriculars brown. Rest of head including frontals, chin and throat, and a superciliary stripe which extends on each side hind-neck, white spotted black. Fore-neck orange rusty, spotted black; lower breast and belly orange rusty, candescing descending, with semicircular and arrow-headed parallel bars along the flanks. Lower belly and vent whitish: with broad centering of sepia to the feathers on sides, crossed with brown bars. Femorals mottled brown.

This is the second new species of wood Partridge I have been fortunate enough to discover in Tenasserim. (The first was sent to the museum As. Soc. in 1855 as *ARBORICOLA BRUNNEOPECTUS*.) It appears tolerably numerous: but as far as my observations go, is entirely confined to the forests on the banks of the Zummee river. Unlike its known congeners, it avoids mountains, and inhabits low though not humid jungles, where the ground merely undulates or rises into hillocks. Like the rest of its tribe, it is difficult to flush, and runs with great rapidity, jumping adroitly over obstacles, and diving into impenetrable thickets for security. Early in the mornings these birds come out on the pathway, scratching about amongst the Elephants' dung, and turning over the dead leaves, for insects. They do not appear to have any crow or call, though during the pairing season this may not be the case. The Karens did not even know the bird: but this is no proof of its rarity, for these people pay no attention to the living products of their forests.



The sexes are precisely similar in plumage and size. The flesh rather dry and tasteless.

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In addition to the above 9 species, which I believe to be hitherto undescribed, I have the pleasure to forward to the Society two specimens, male and female, of that little known bird, the *PODICA PERSONATA* of G. R. Gray: who has named it from a specimen from Singapore sent to the British Museum by Lord Ellenborough.

The following observations are taken from fresh subjects.

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Tribe. *Macroductyli*.

Family. *Fulicidæ*—Genus *PODICA*, species *PERSONATA* (G. R. Gray).

Spec. Male and Female, March and April 1859. Kokanee river, near Moulmein.

*Dimensions.* Male. Length 22". Spread of Wings 30". Wing  $9\frac{1}{2}$ ". Tail  $4\frac{3}{4}$ ". Bill 2". Femur  $3\frac{1}{4}$ ". Tarsus 2". M toe  $2\frac{5}{8}$ ". Female, rather smaller.

*Details.* Body plump and flat as in *ANAS*, not so heavy as in the Grebes. Neck lengthened: but less so than in *HELIORNIS*. Legs so far back as to compel a nearly upright position when the bird stands. Wings and tail nearly as in *ANAS*. Bill as in *GALLICREX*, longer than in *FULICA*, straight, long, compressed, with rounded culmen. Tip deflexed gradually, and without notch. Nostrils large, midway, oval, horizontal, pierced at anterior end of a large membrane, which is strongly relieved from culmen above and to the side below. Gonyes angulated and short. Gape deflexed and wide. Culmen ends in a straight line across forehead, protruding a little flap on the forehead (as in *PARRA*), but smaller. (This quite disappears in the dry skin.) Tongue linear and simple. Leg as in *FULICA*, pretty stout in depth: but compressed laterally (not so much as in *PODICEPS*), narrow transverse scutæ anteally, rest of leg and toes reticulated. Toes long, the outer and middle ones subequal, inner one shortest. All three lobated, the inner flap of inner toe being broadest. The scallops (one to each phalanx) about as broad as in the Coot. Thumb plain, reticulated, not very short. Claws hooked, long and sharp.

Wings tolerably ample, pointed, as is each remix. 3rd primary

longest, 2nd subequal.  $4\frac{1}{2}$ ". Shorter, 1st one inch shorter. Tail round, acuminate, rather short: coverts long. 14 rectrices with stiff strong quills. Plumage as in ANAS, *i. e.* not so dense as in the Grebes, or Coots.

*Color.* Male. Iris sepia. Bill horny yellow, dark on culmen and green on forehead. Legs a delicate rice-green, the lobes margined yellow and claws whitish. All upper parts olive-brown, reddest and clearest on wings and tail, and on top of back dulled with greenish ashy. Crown and mesial nape a clearer ashy blue green. Forehead extending in a point to vertex, and again laterally over each eye, black, which covers also chin, face, throat and anteal neck, ending in a point half way to breast. This black space is margined all round with white, starting from posterior canthus of eye, and another small space of white borders the bill at lorum. Breast and flanks pale ashy olive brown, femorals the same. Under tail-coverts and flanks next belly barred white. Belly and lower breast dull brownish white.

Female. Has the iris straw-color; chin, throat and anteal neck, where black in the male, white with a margin all round of black, which extends a little over lorum, and has the same white outer border, as has the black mask of the male. *Cætera pares.*

These very rare birds in Tenasserim are met with in shady, deep, narrow streams in forests, whether in the tide-way, or remotely inland. They swim rapidly: but seldom dive, and although eminently aquatic in conformation, resort, strange to say, for safety to land. Scrambling up the steep banks when shot at, and running with unexpected rapidity into dense thickets, its flight is like that of the Coot, or Water-hen: squattering along the surface of the water. The eggs I have not seen.

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*Botanical Notes made during a month's tour from Moulmein to the three Pagodas and in the Shan States, in the month of February, 1859.—By Rev. C. PARISH.*

Having been asked by Major Tickell, to furnish him with a few botanical notes to add to his sketch of a short tour we lately made in company to *Thoonzoo*, or the “*three Pagodas*,” and thence, through the Siamese Shan States, to the Houngdrau river, I do so with pleasure, though with some diffidence, as my acquaintance with the Flora of these Provinces is exceedingly limited.

We left Moulmein on the last day of January, and proceeded up the Attaran river in boats.

As the point where we began our journey is so near the sea (only some thirty miles) it may be as well to commence by stating what the prevailing vegetation is between Moulmein and the mouth of the river. Here, then, on the muddy shores, is seen, as usual in such places, the mangrove; but the most noticeable feature in the vegetation, is a continuous jungle of the graceful *Sonneratia apetala*, stretching far in, wherever the land is subject to tidal inundation. Underneath the *Sonneratia* is a dense growth of our common thatch leaf, *Nipa fruticans*. The elegant little Palm, *Phoenix paludosa*, is not unfrequent; and *Cerbera manghas* may be noticed all along the banks, suspending its apple-like fruit over the water. These are the trees that will probably attract particular attention, as one ascends our large river to Moulmein.

Leaving this now, and supposing ourselves to be ascending the Attaran, the plant that appears most abundant is *Paritium tiliaceum*, which grows all along the water line for several miles, forming a perfect tangle with its twisted stems. A very large and handsome *Batatas* may be occasionally noticed twining about it. *Sonneratia acida* has here taken the place of *S. apetala*. *Barringtonia racemosa*, and one or two species of *Diospyros* occur here and there. These are close to the water's edge, while, on the bank, and forming a narrow belt of jungle (inside which is paddy cultivation) *Butea frondosa* grows in profusion. *Salmalia malabarica*, *Barringtonia acutangula*, and *Acacia elata* or *stipulata*, are also abundant.

*Lagerstræmia reginæ* is frequent, with *Pongamia atropurpurea*, *Vitex arborea*, *Ficus*, and other trees. About the villages, the following wild fruit trees are commonly found: *Mangifera oppositifolia*, (Burm. *Mayan*); (of this tree there are two varieties, one with sweet, and the other with acid fruit); *Pierardia sapida* (Burm. *Kanazo*), and *Eleagnus confertus* (Burm. *Mengu*); *Sandoricum indicum*, (Burm. *Thit-to*) is a frequent tree, the fruit being also eaten: so is *Eriodendron pentandrum*, cultivated for its silky cotton, used to stuff beds and pillows. *Mesua pedunculata* also occurs, though rarely.

The site of the Burmese villages is almost invariably marked by cocoa-nut and palmyra trees; the latter planted wherever there is a Pagoda, or monastery. The Phoongees also show their taste by cultivating near their monasteries *Amherstia nobilis*, *Mesua ferrea*, and *Calophyllum inophyllum*.

Some distance up the river, where the plains on either side are too high to be subject to periodical inundation, they are covered with vegetation continuously inland from the banks, and then the prevailing tree is the "*Eng*" of the Burmese, *Dipterocarpus grandiflorus*. Sometimes this is the only tree for many miles, when it forms a thin open forest, intensely hot, as the trees prevent the free circulation of the air; while, from their scanty foliage, they afford no protection from the rays of the sun. The leaves of the young tree, however, are very large, and are collected by the natives for roofing their houses; also for the sides, when they cannot afford the *Nipa* thatch, or procure the long grass (*Imperata cylindrica*) which is the roofing material in other places. Often intermixed with the *Eng*, grow *Careya arborea*, *Dillenia aurea*, two or three species of *Erythrina*, *Gardenia*, *Randia*, and a small *Quercus*. In these forests there is little or no undergrowth, but here and there, in the swampy places, patches of high grass.

The fern of the river banks is *Drynaria quercifolia*, which clothes the trunks of all the old trees from top to bottom. *Orchideæ* appear generally to be rare by our river sides, although one would be disposed to think that the moisture would favour their growth. *Loranthus pentandrus* is a common parasite, and *Viscum moniliforme* a rare one. It is in such places that are found those three beautiful

creepers, *Echites macrophylla*, *E. rhynchosperma*, and *E. paniculata*. The first of these yields a considerable quantity of *Caoutchouc*. A very elegant *Rosaceous* creeper is frequent on the river banks; other kinds too are numerous, whose foliage is handsome, but whose flowers I have never seen.

Higher up the river (twenty or thirty miles or so), still within tidal influence, but where the banks are not so muddy as they are below, *Paritium tiliaceum* ceases, and a species of *Salix* (*S. tetrasperma*?) takes its place, and continues until, at about the point where the flood tide fails, it is in turn succeeded by a willow-like *Euphorbiaceous* plant, *Hæmatospermum neriifolium*, as the front occupant of the bank. The *Salix* has here assumed the proportions of a tree, and overhangs it. The same *Euphorbiaceous* shrub also covers the small islands, which are frequent in the shallow and rapid parts of the river.

The appearance of the vegetation has now changed considerably. The banks of the river are steep and high, and the jungle much wilder and more dense. Bamboo, (*Bambusa tulda*?) is abundant; long rafts of it are floated down to Moulmein for building purposes, and other uses. Tall rank grass crowns every spot on the bank that is destitute of trees. *Calamus draco*, *C. verus* and *C. rotang*, are frequent; the two last ascending to the tops of the highest trees and forming an impenetrable tangle below. Nothing can be more elegant than the shining glossy foliage of these slender canes as they wave to and fro to the wind.

Now *Butea superba* will be detected by its deep orange-coloured blossoms, seeming to be those of some large forest tree, at the very top of which they delight to open out. The huge pods of *Entada pursætha* catch the eye. The bright yellow flowers of a species of *Ochna* (*O. lucida*?), having the fragrance of the violet, are a great ornament to the banks. The modest flowers of *Capparis trifoliata* may be frequently noticed, and the petals of creeping *Bauhinias* are seen floating down the stream. *Flacourtia cataphracta* is a not uncommon tree, and here and there, towering above every thing else (the true giant of the forest), a huge wood-oil tree, *Dipterocarpus alatus* or *turbinatus*? *Duabanga sonneratioides* is common in some spots. This is a handsome tree with very large leaves, and branches

which spread out horizontally. The inflorescence consists of large terminal *corymbs* of white flowers, whose weight causes the branches to droop elegantly.

Here too grow many other trees, of which I must confess myself ignorant. Among them, a very graceful one with light birch-like foliage, is especially noticeable, being so abundant as to give quite a character to the vegetation. It had neither flower nor fruit when we passed.

We left the boats at a place called *Thaliya-zeik*, about eighty miles or so from Moulmein by the river course, which is very tortuous; and thence proceeded by land to *Thonzoo* or the three Pagodas.

During the whole of our journey, from the time we left the Attaran until we struck the Houndrau river (thirteen days), one and the same Geological formation prevailed, viz. mountain (?) limestone; there was consequently a general sameness in the character of the vegetation. It will not, therefore, be necessary to do much more than throw together the names of those trees and other plants, which I noticed in the journey as being known to me.

For the benefit of those who have not travelled in the Tenasserim Provinces, and are not perhaps aware how rank is the vegetation all over them, it may be as well to mention, that while we continued on low ground, it was a rare circumstance to see more than a hundred yards in advance; and so dense in many places was the jungle, that an occasional sight only was obtained of the tops of the magnificent perpendicular limestone rocks, at the very foot of which we were passing. And afterwards, among the mountains, the case was very generally the same. Anything that could be called a view of the country was rarely obtained, an occasional glimpse of some distant feature in the landscape being all that we could catch through the trees.

At the spot where we left our boats, *Thaliya*, the alluvial plain, which, nearly up to this point, had stretched far away on either side of the river, may be said to have been fairly left behind. Indeed, for some miles before reaching *Thaliya*, the high banks were seen to consist almost entirely of rolled pebbles, cemented into a coarse conglomerate, as if the river, as it wound its way about the

base of the low hills, which begin here, had cut its bed through an ancient sea-beach. From this point our course lay in a generally S. E. direction, through undulating country, having a gradual rise, until at "*Thonzoo*" a height of some seven hundred feet had been gained. As we advanced, the surface of the ground became more rugged and broken, and more denuded of soil, the limestone rocks protruding more and more frequently, leaving at the "*three Pagodas*" little else than bare rock.

Along this course, in many places, thick bamboo jungle prevailed with large trees thinly interspersed. In other parts what we commonly understand at home by forest was passed through. The forest portions were generally dry and for the most part destitute of undergrowth. It was in the damp hollows, and near the streams, or under the shade of some high rock, that the shrubs and herbaceous plants were rank.

In the forest or drier parts of the jungle, the following trees formed a great part of the vegetation. *Dillenia aurea*, and *D. speciosa*, the fruit of both of which is eaten by the Burmese and Karens in their curries, or rather boiled mixtures, on account of the enlarged permanent fleshy calyx, *Careya arborea*, *Lagerstræmia Reginae*, and probably two or three other species, one being abundant, which had knotty protuberances on the trunk, which I had not noticed before on *Lagerstræmias*. These nodes were frequently so sharp as to offer serious obstacles to those who climb with naked feet. *Bignonia stipulata*, *B. crispa*, and others were also common. I do not recollect to have noticed *B. (Spathodea) Indica*, which is frequent about Moulmein. I also observed *Pterocarpus Indicus*, *Dipterocarpus lævis*, and *Hopea odorata*, the two last of which become scarcer as the soil becomes more shallow and rocky, several species of *Dalbergia*, *Inga xylocarpa*, *Acacia elata* (?) and huge fig trees. The teak (*Tectona grandis*) was very local, and only small trees are now left standing, but these in considerable abundance. *Gordonia floribunda* which in the neighbourhood of Moulmein and Tavoy is a common tree was here very rare. Two or three species of *Sterculia*, form large trees, *Vitex arborea* and *V. alata*, *Erythrina Indica*, *E. stricta*, *Nauclea*, *Terminalia* and others, several species of *Bauhinia*; *Pterospermum semisagittatum*, and *Pt. lanceæfolium*.

Besides these, two of the most abundant and remarkable trees were those called by the Burmese *Xamanay*, and *Myouk Kyan*. The former (*Gmelina arborea*) is a tree of middle size (fifty to sixty feet) with a diameter of perhaps two to two half feet, a rather short trunk, and singular meazly bark, covered with depressed scar-like spots, by which the tree is at once recognized. It was in full flower, and the ground was strewed with the fallen *Corollas* every morning. I have good dried specimens of it. The latter, *Myouk-kyaw*, *Homalium tomentosum*, meaning the monkey slipping tree, is so called, because not even a monkey can climb it. This peculiarity arises from the smooth lively green bark being covered with a white pulverulent substance, which comes off upon the hands, when an attempt is made to grasp the trunk; so that neither man nor monkey can succeed in climbing it. For the same reason, *epiphytes* cannot attach themselves to this tree. Not an orchid, nor a moss, nor so much as a lichen, is ever seen upon it, unless by chance a plant becomes lodged in a fork, which I once only noticed in the case of a bunch of *Cymbidium aloifolium*. The tree is tall, about eighty feet high, with a diameter of not more than eighteen inches, or, at the most, two feet, and has a straight trunk, destitute of branches up to a considerable height. The foliage is scanty. Mr. Mason, in his book on the Natural Productions of Burmah calls it "Tenasserim Lancewood" and thinks it is a species of *Dalbergia*, but the leaves are simple and alternate, not pinnate or compound. The undergrowth, in these jungles, where abundant, consists in great part of the following: *Euphorbiaceæ* (this order is largely prevalent); *Randia*, *Gardenia*, *Ixora*, *Morinda*, *Pavetta Indica*, *Mussaenda Wallichii*, and other *Cinchonaceæ*; *Connarus*, *Poivreia*, *Combretum*, *Unona*, *Uvaria*, *Melastoma Malabathricum*, *Memecylon ramiflorum*, *Leea*, *Helicteres*, *Ardisia villosa*, and *A. umbellata*, *Clerodendron nutans*, and *infortunatum*; *Barringtonia acutangula*, *Erythroxylon laurifolium*, *Urtica*, *Hibiscus*, &c. The most strikingly abundant of these are *Mussaenda Wallichii*, *Melastoma Malabathricum*, and *Clerodendron infortunatum*.

The herbaceous plants are mostly gregarious *Acanthaceæ* in the dry and hilly parts, and *Zingiberaceæ* in the damp valleys. One large species *Zingiber squarrosum* (?) is the most abundant of these.



Of annuals, at this dry season, none were visible. In the swamps and dark hollows, the vegetation is peculiarly tropical in appearance. In such places grow various species of *Calamus*, *Corypha Taliera* (?), *Licuala peltata*?, *Zalacca edulis*, *Caryota urens*?, *Wallichia caryotoides*, *Areca*, *Pandanus*, *Arum odorum*, *Colocasia antiquorum*, *Pothos scandens*, *P. Lasia*, *P. gigantea*, *Scindapsus officinalis*, and *S pinnatifida*. Ferns too rejoice in such localities: for here flourish *Goniopteris lineata*, *Angiopteris crassipes*, *Dictyopteris macrodonta*, *Sagenia hippocrepis*, *Pteris longipinnula*, and other species. These grow on the ground, while *Lomaria scandens* and *Leptochilus axillaris* (the former especially) climb to the tops of the trees, and add much to the denseness of the foliage and to the gloominess of such spots.

In waste places, near the sites of deserted villages, the “*ruderales*” are *Sida acuta*, *Urena lobata*, (both these used for cordage in Moulmein), *Leucas Zeylanica*, *Gendarussa adhatoda*, *Blumea grandis*, *Cyanotis* (Sp.?), *Momordica mixta*, and other species, *Ipomœa vitifolia*, and others.

Among the orchids collected on this journey, I may just mention *Vanda gigantea*, of which plant, though only once met with on this occasion, there was more in one mass, than could be conveniently packed away on an elephant. It was indeed a most wonderful aerial growth. The *Dendrobies* were *D. Dalhousianum*, *D. Pierardii*, *D. Aggregatum*, *D. formosum*, *D. clavatum*, *D. teres*, *D. moniliforme* (?), and two more handsome species with large orange-coloured flowers, whose names are not known to me. I observed also *Saccolabium guttatum*, *Aerides cornutum*, a fine species allied to *A. affine*, *Cymbidium aloifolium*, two or three species of *Oberonia*, a very handsome species of *Limatodes*, one species of *Cirrhopetalum*, and two species of *Cypripedium*, one with very large flowers. These were nearly all in flower. Besides these, many kinds of small orchids were collected. I must not forget to add one other. (*Cyrtosia* species?) a singular leafless plant, which I met with only once. Its roots (few and fleshy) were in the ground, and its stem, which was of the thickness of a small cane, was thirty feet in length! The place of leaves was supplied by fleshy stipulate bodies, which were alternate, having an aerial root opposite each one, by which

it attached itself to a tree and scrambled among its branches. The flowers were numerous, at the end of the branched stem in loose panicles, rather large, boat-shaped, yellow. The whole plant has been sent to Sir William Hooker for determination with many other things.

Of other *epiphytes*, there were various kinds of *Aeschynanthus*, *Hoya*, and *Hedychium*. The most frequent creepers or climbing plants, were *Butea superba*, *Congea velutina*, and *Thunbergia laurifolia*. These three may be said to be ubiquitous. It is extremely remarkable that the last-named plant should have remained, until so very lately, undescribed, when we consider that several Botanists have visited our jungles, that it is almost impossible to walk two or three miles in any part of the Provinces without meeting with it, and that it is in flower nearly all the year round. The beauty of the jungles was much increased by these three fine creepers, as they were all in full flower at this time. A species of *Pongamia*, with small purple flowers, is a great ornament also. A large thorny *Mimosa* is common, *Paratropia digitata* occasionally occurs, and a species of *Clematis*, also different kinds of *Asclepiadeae*, *Bauhinia*, *Dioscorea*, *Momordica*, *Cucurbita*, *Ipomoea*, *Mucuna*, &c.

The *ferns* gathered, or noticed, besides those mentioned above, were *Drynaria quercifolia*, *D. irioides*, *Alsophila gigantea* ? *Asplenium nitidum*, *Neottopteris nidus*, *Digrammaria esculenta*, *Drymoglossum piloselloides*, *Polybotrya setosa*, *Nephrodium molle*, *Lygodium scandens*, *Pteris pellucida*, *Pt. biaurita*, *Pt. aquilina*, *Adiantum Capillus Veneris*, *Trichomanes Javanicum*, *Schizoloma ensifolia*, *Platyserium Wallichii*, *Ophioglossum pendulum* and others. *Drynaria quercifolia* strange to say, was never seen in the hilly district of the Siamese Shan States, but its place was there supplied by *D. Coronans*, which in like manner, was entirely absent from the plains. With the *Alsophila* I am puzzled. *A. gigantea* is said to grow fifty feet high, and the Tenasserim Mountains are given as one of its habitats. I have seen something of the Tenasserim jungles and hundreds of this plant (specimens of which sent to Sir W. Hooker have been named *A. gigantea*) but *never one* with a true caudex or one that could be fairly called a tree fern. It is generally from five to six feet high only, the fronds themselves being that length. I have, however,

seen one plant, though only one, with a *pseudocaudex*, such as *Lastrea filix mas* and *dilatata* occasionally have at home, about 18 inches long. It is one of the commonest of our ferns, and it is strange, that if it does ever attain the height given, I should never have seen one at all approaching to it. I am disposed to think that there are no tree ferns in the Provinces. Those ferns, whose habitats are trunks of trees, were dried up, such for instance as some of the genus *Davallia*, otherwise the list would have been much larger.

Of *Lycopodia*, I met with two species, both pendulous; *Lycopodium Phlegmaria*, and *L. ulicifolium*. Of *Selaginella*, two species, I think, *S. Willdenovii* and *S. flabellata*. These were not in our territory, but in the district of Kiouk-Koung. They do, however, grow within our Provinces.

*Mosses* are scarce in Burmah. Of terrestrial branched kinds like our beautiful *Hypna*, there are none, or scarcely any, and those on trees are few, and nowhere in abundance. The only moss which I have seen growing with anything like the luxuriance of those in temperate climates, is *Meteorium squarrosum*, which, in damp dark jungles, hangs gracefully from the small branches of the underwood to the length of six or eight inches. This species, with *Octoblepharis albida* and *serrata*, *Leucoloma Taylori*, *Funaria hygrometrica*, and half a dozen others (barren) constitute my whole collection of mosses made on this occasion.

I have already alluded to the magnificent limestone rocks, at the foot of which our path frequently lay. They are a striking feature in the scenery of this part of the provinces. They have a general course S. E. and N. W., and though now broken up into detached masses and often separated by many miles, were plainly, at one time, continuous. At *Thonzoo (the three Pagodas)* a distance of some ninety miles, as the crow flies, from Moulmein, we seemed to have reached nearly the last of these remarkable rocks, though not the end of the limestone formation. The site of the (so-called) three Pagodas (really nothing more than three heaps of stones raised to mark our boundary in this direction) is nearly as rugged as the top of one of them, worn away as the summits of all of them are into needle-like points; the rocks protruding through the

scanty soil in all directions, in large masses. The plants consequently growing at this spot, are for the most part, the same as those which are found on similar rocks near to and even north of Moulmein, and which are not found anywhere but on these rocks. Such are *Cycas circinalis*, two species of *Dracæna*, and what I take to be a species of *Caralluma*, though I have never seen the flower. Near Moulmein, one would have to climb the rocks to a considerable height to find these plants, while here they are gathered without climbing, the general rise of the country being about equivalent to the height at which they grow there.

This is a most interesting spot to a Botanist, abounding with a number of curious plants, and well deserving a longer stay than we could afford, only two or three hours. A want of water for men and elephants, in the dry season, makes it necessary to push on beyond it. A profusion of orchids grow on the rocks, and on the small stunted trees (chiefly *Eugenias*) that cover the rocks. I gathered here the first *Cypripedium* I had met with in the country, *Dendrobium clavatum*, *D. formosum*, *D. teres* in abundance, also two or three other *terete*-leaved orchids of different genera, one a *Cymbidium*, and one I think an *Aerides*, with a number of smaller sorts.

*Thonzoo* is a wild desolate spot, with more of open country about it, than we had as yet seen. The jungle is thin, composed chiefly of *Dillenia*, *Careya*, *Erythrina*, *Eugenia*, and a species of *Dipterocarpus*, all of which are stunted and weather-beaten from exposure to the S. W. Monsoon, to the full force of which this spot is open. The few plants mentioned as gathered here all grow within the space of a few hundred yards. I had no time for more than the most cursory examination of this place, and this was done at mid-day, when the heat of the sun reflected from the rocks was intense. Judging from what I gathered in the time, and from the numerous dried remains of herbaceous plants, I fancy that a rich harvest would be reaped here by a Botanist, who should visit it during the rainy season, or immediately after its close. *Cyperaceæ* appeared especially numerous, and other bog plants would probably be found in abundance, as I noticed here (for the first time in the provinces) patches of genuine black spongy peat-soil in the hollows, which still retained moisture; no trace, however, of *Sphagnum* could be detected.

Leaving *Thonzoo* we entered the Siamese State of "Kiouk-Koung," and our course lay at first Eastward, then Northward and Eastward, until, in seven days, we again reached our boundary on the HOUNGdrau river. The country crossed in the interim consists of a mass of limestone hills, whose height averages 2-3000 feet, clothed from top to bottom with the densest jungle. Although apparently of the same geological formation as the perpendicular rocks before mentioned, they have a rounded outline, and are covered with a rich clayey soil, in some places of considerable depth, the colour of the clay varying from red to yellow.

Unless I am altogether mistaken in considering the rocks to be geologically indetical, it appears strange that two contiguous portions of the same formation should have so strikingly different an outward character; the one, that of interrupted chains of rock with perpendicular faces, and singularly rugged and fantastic outline: and the other, that of an ordinary mountainous district of alternating valleys and hills. It appears difficult to understand how one portion could have been subjected to eruptive forces from beneath, which would not have equally affected the other, seeing that they are so close, some of the abrupt rocks actually running into the valleys of (what I call) the hilly portion!

The difference, however, in the direction of the strata may perhaps be one cause of the marked difference in their form; for, whereas in the perpendicular rocks (as seen near Moulmein) the strata dip at a considerable angle to the Eastward, in the hilly district of Kiouk-Koung they are horizontal or nearly so; and I imagine that those rocks which present their edges to the action of the weather, are more liable to be worn into a rugged outline than those whose strata are horizontally disposed.

It was sufficiently easy to observe the disposition of the strata, as the beds of the hill streams form, generally, the only practicable, path across this wild district; and, in these water-courses, the streams fall over a series of regular steps, formed by perfectly flat slabs of rock overlying each other horizontally; these slabs being often from ten to twenty feet broad, and two or three feet thick. And that they are Limestone was shown by the fact that small *stalactites* were of frequent occurrence on the perpendicular faces of the steps

where the stone was hollowed out underneath. In making these remarks, I do not affect any acquaintance with Geology, I only note what I observed.

I was struck with the wonderful luxuriance of the vegetation of this district. It surpassed anything I had seen within our boundary. At the first village, Waytamaraing, where we halted, it was particularly remarkable. This village lies in a valley enclosed by hills on all sides, and has an elevation above Moulmein of some five hundred feet. A small stream called "*Thoung Kaliya*" runs through it, whose waters flowing S. E. eventually fall into the *Menam*. At this place the rankness of the vegetation, even at this dry season, was surprising. All the plants previously mentioned as growing in damp shady spots grew here, and with increased luxuriance. The jungle was impenetrable from the abundance of various species of *Bambusa*, *Calamus*, *Zalacca*, *Licuala*, *Corypha*, *Caryota*, &c.

The trunks of the large trees were clothed to the top with Aroidæ, or the frequent *Lomaria scandens*. Almost every available fork had *Neottopteris nidus* seated in it, the fronds of which were six feet long ; while different species of *Hoya*, *Aeschynanthus*, *Hedychium*, and the larger *Orchideæ*, loaded and festooned the boughs. The undershrubs were covered with small *Orchideæ*, the pendulous *Meteorium squarrosus*, and *Jungermannia*; and the ground, was, in many parts, knee-deep in beautiful *Selaginellæ*. Two *epiphytes*, seen here, struck me as new: one, a very graceful *Aeschynanthus*, with small ovato lanceolate leaves, and pretty pinkish flowers, which hung down from the branches, to the length of three or four feet: the other, a small erect species of *Peperomia*. I found too a small *Tetranthera* here, which I had never seen before.

But that which delighted me most, was a very beautiful tree of middle size in full flower which had not occurred before. I cannot describe it better, in a general way, than by saying that it exceedingly resembles the common Horsechestnut. No one could see it without being at once struck with the resemblance. It is a dense umbrageous tree, about forty feet high. On examination, my surprise equalled my delight; as it proved to be a true *Aesculus*.\*

\* Mr. Parish's horsechestnut is *Aesculus Punduana*, Wall. It extends from the Khasia mountains along the tropical belt of the Himalaya as far west as Sikkim and specimens of it occur among Dr. Falconer's Moulmein Collections. T. T.

The leaves are opposite, palmate, with seven leaflets. The *inflorescence* is a terminal, erect, rigid panicle about eighteen inches high. The *flowers* appear to be diœceous for I could find no trace of a germ in any which I gathered. The *Calyx* is tubular, 5-parted, irregular. The *petals* are four, a fifth being wanting in front. Their colour is white, the two upper ones being beautifully tinged with red and yellow. The *stamens* are seven, long, filiform. The *anthers* are versatile, 2-lobed, opening longitudinally. My dried specimens are fortunately excellent, and the flowers have preserved their colours perfectly. They will shortly be sent to Sir W. Hooker.

The vegetation in the low valleys of this district is such as I have attempted to describe. That on the hills is mainly composed of *Bambusa gigantea* (Burm. *Wa-bo*.) with large trees interspersed, mostly of the genera before named, with the addition, however, of many, which I regret that my limited acquaintance with the forest trees, prevents me from specifying. Perhaps the most abundant trees are *Dilleniæ* and *Gmelina arborea*. *Hopea*, and *Dipterocarpus* still occur, but scantily; nor do they attain the gigantic proportions which they reach in the lower lands. Two very useful cordage plants appear to be plentiful; one is *Hibiscus macrophyllus* and the other a *Sterculia*. An excellent rope of great strength is made of these materials by the Burmese and Karens in a few minutes. The undergrowth on these hills is chiefly made up of *Cinchonaceæ*, and gregarious *Acanthaceæ*. In the rainy season the ground would be covered with *Zingiberaceæ*, the decayed leaves of which were seen every where. Nearly the only species that remains green in the hot season is the before mentioned *Zingiber squarrosus*, the fine broad leaves of which form a conspicuous feature in all the damp shady hollows. I must not forget to mention that the beautiful *Thunbergia laurifolia*, never left us for a day even here, scarcely for an hour, so universal is it in this part of the world. In the higher valleys that fine sombre Palm, *Arenga saccharifera* (*Saguerus Rumphii* Roxb.) is abundant. Although, according to Seemann, this Palm is applicable to so many domestic purposes (yielding toddy, sugar, and sago, besides a valuable substance for cordage in the strong fibres about the base of the petioles,) I am not aware that it is put to any single use whatever by the natives here. The

same Palm grows also in our Provinces on the hills that lie between *Kankareet* and the *Thoungyeen* river.

On an extensive tableland, with an elevation of about two thousand feet, which we crossed, I think on the third day after leaving "*Thonzoo*," the vegetation was almost as rank as in the low valleys. We passed through a great deal of tall grass. Bamboos were plentiful, and the prevailing trees still *Dillénias* and *Gmelina arborea* with large *Sterculias*. Here also grew abundantly a fine *Pandanus*; it had no aerial roots, but shot up perfectly straight for some thirty or forty feet, and then branched once or twice dichotomously. The leaves drooped as in other species. The extent of this tableland was considerable, giving an area, I should say, of several square miles. The soil was evidently rich, and the high hills which surround it on all sides, supply it abundantly with water. If the approach to it were only more practicable, it would offer a fine, as well as most picturesque site for a settlement.

On the third or fourth day after leaving *Thonzoo*, we arrived about sunset, after a long march, over very steep hills, at an unusually romantic spot; at least, so it appeared to us. Perhaps, however, the great charm was that we here emerged for awhile from the jungle and could see a mile or so before us. A small extent of country suddenly opened upon us clear of jungle. The only vegetation was long grass, recently burned, with *Pteris aquilina*, and here and there a *Dillenia*, and the ever-recurring *Yamanay* *Gmelina*. Snugly ensconced in a hollow lay a Siamese village of a few houses, reminding us at once of a Swiss Chalet. This effect is produced by the form of the houses which have low pitched roofs and widely projecting eaves, also by their generally rustic character. The *Wa-bo* (*Bambusa gigantea*) forms the whole material for house-building. Whole bamboos furnish the posts; portions of the same, split and interlaced in various ways, the sides and floors, which according to the universal custom here and throughout Burmah, are raised some six or seven feet from the ground, while the roof is composed of long lengths of half bamboos, with their concave and convex sides alternately uppermost, and overlying each other after the manner of rounded tiles. The name of the village is *Loon-t'he-Koung*. The clearing, though extensive, was, no doubt, artificial,



since the higher hills all round were covered with the usual thick jungle. It is strange how *Pteris aquilina* should find its way to such a clearing, and at once establish itself! The elevation is about 2000 (1919) feet above Moulmein. The Thermometer, just before sunrise on the 17th or 18th of February, stood at 52°, a temperature which sensibly affects those who have been walking, but a few hours before, in a noonday sun, and a temperature of 120°. On an adjoining hill about 500 feet higher, stood a tall solitary specimen (apparently) of *Borassus*. I could not approach it for the jungle, but there can be little doubt but that it was wild, as that hill had never been cleared. Besides which the Karens cultivate no Palms whatever and the Burmese gave it the name of *Tau-tan* or wild Palm. A small stream, rising in the higher hills, flows near this village; and on its banks the same *Salix*, which, fringes our river sides, at or near the level of the sea, in the form of a mere bush, is seen growing to a large tree having a height of some forty feet, with a diameter of 18 inches. Besides the *Salix*, the three most prevalent trees, by all the hill streams, were the *Æsculus* before mentioned, *Meliosma* (*Millingtonia* *Roxb.*) *simplicifolia*, and a very fine large-leaved, large-flowered *Eugenia* (*E. aquea*? *Roxb.*) We have, then, at this place, with an elevation above the sea-level of some 2000 feet, *Æsculus*, *Salix*, and *Pteris aquilina*, growing in company with *Borassus*, *Dillenia*, *Dipterocarpus*, *Pandanus* and other tropical forms. I may mention that I found *Pt. aquilina* growing on as low a level as 1000 feet above the sea in this district, also *Funaria hygrometrica*. At about the same level I gathered also *Adiantum Capillus Veneris*, on rocks in the *Megatha* river.

The Karens, who inhabit this wild district, are few, and their villages many miles from each other. They live entirely on vegetables, and have no domestic animal but the dog. Though their jungles abound with wild fowl, they keep no poultry. The purchase of eggs or milk, of anything indeed, but rice, is, therefore, hopeless. Their cultivation is of the rudest kind, a fresh clearing being made every year for their rice-crop, which is their chief food. Besides rice they grow, however, tobacco, sesamum, cotton, sugarcane, and chillies. They seem fond of flowers, for a quantity of

marigolds were growing in the paddy clearings, also a small yellow everlasting flower, and occasionally I noticed a patch of the red plumbago.

On descending again into the plain, there was a daily repetition of the plants already specified. The only trees not noticed before were *Jonesia*, *Citrus*, *Panax*, and a *Cinnamomum*, to which I may add a fine species of "*Calanthe*" and one of that curious order *Cytinaceæ*.

We struck the Hougdrau river at Meetan on the 22nd day after leaving Moulmein, thence dropped down the river to a place called *Kyik*, from which lies the path leading to the top of *Moolee-it*, a mountain according to Major Tickell's measurement some 7000 feet in height. My chief object in undertaking this journey was to make the ascent of this mountain; but it was not my good fortune to do so. I here left Major Tickell, and dropping down the river in a light canoe, reached Moulmein in two days.

*Note by Dr. T. Thomson.*

Excellent specimens collected by Mr. Parish have enabled me (at his request) to introduce into this most interesting account of the vegetation of the Attaran river, the names of the *Homalium Æsculus* and *Gmelina*. I am further responsible for the name *Duabangha* which I know from the Wallichian Herbarium to be a native of the province, and which I think I can recognize beyond mistake in Mr. Parish's description. I can suggest no other alterations save that the *Padouk* of Pegu and Tenasserim is, I believe, rather *Pterocarpus dalbergioides* than *P. indica* as stated in the text, and that the tree with light birch-like foliage mentioned at page 460 is probably *Conocarpus acuminata*.

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*On the History of the Shwe Dagon Pagoda at Rangoon.—By Lieut.-Col. A. P. PHAYRE, Commissioner of Pegu and Agent to the Governor-General of India.*

The great Pagoda at Rangoon, known as the Shwe Dagon or Golden Dagon is the most celebrated object of worship in all the Indo-Chinese countries. Like most Boodhist pagodas in Burmah it is simply a solid mass of masonry. But this building derives its peculiar sanctity, from having enclosed in its interior shrine, below the surface of the ground on which it stands, relics of the last Boodha Gautama, and personal implements or garments used by the three preceding Boodhas.

The legend of the first building of the Shwe Dagon pagoda dates from a very early period in the history of the Mon or Talaing race. Before the birth of Gautama, a King reigned over the Talaings in the Delta of the Irrawaddy at a city called Okkalaba.\* The site of the city so named was originally at a spot now known as Twantay, situated about sixteen miles West from Raugoon. Near that city lived a pious merchant named Tha-ka-lai and his wife Tha-ta-bhan. On account of his worthiness, and by virtue of his former works of merit, he received a title and high distinction from the King of the country. He had two sons named Pa-oo and Tapau. The first signifies in the Mon language *dove*, the second *plenty*; both names being derived from gifts and alms offered and bestowed by their parents at the birth of these children. The two young men having heard that a famine existed in the Western countries, determined

\* It is curious to observe how remote and obscure traditions linger among semi-civilized races and influence their present actions. In the autumn of 1858 a poor fisherman near Twantay, having dragged up in his net from a stream a small image of Boodha, believed this to be an omen of his high destiny. In accordance with Boodhist principles he believed he would rise in the scale of being, restore the Talaing kingdom, and revive religion.

A few desperate characters, willing to profit by his fanaticism, gathered round him. They took possession of the town, issued proclamations, and were proceeding to the temple to inaugurate the fisherman in his new calling, when they were stopped in their career, and all arrested. The fisherman escaped for the time, but was given up by the villagers the same night.

to convey there a ship-load of rice, to distribute among the people. They sailed, and in due time cast anchor on the coast of the country, which it is presumed was the shore at the mouths of the Ganges. From thence they proceeded, one day's journey to the city of Ban-da-wa.\* They hired there five hundred carts; returned with them to the ship; loaded the carts with rice, and proceeded again towards the city. What next befel them is thus narrated in the chronicles of the Pagoda:—

“As the brothers went on, she who in a former state of existence had been their mother, now the guardian Nât of a tree, asked of them, ‘Whither go ye to buy and sell?’ They replied, ‘We go to the city of Ban-da-wa.’ The Nât said, ‘Desire ye gold and silver merchandize, or rather desire ye heavenly treasure?’ The brothers replied, ‘We desire heavenly treasure.’ The Nât answered, ‘If that be true, then go ye to the place where the Lord is.’”

Guided by the Nât for several days the two brothers reached the place where Gautama then was. The date of their arrival is said to have been Wednesday, the 13th day of the waning moon Wakhong in the year 103.†

The interview of the brothers with the Boodha Gautama is recorded in the life of the philosopher, which has been translated and illustrated with a luminous commentary by the Right Reverend Bishop Bigandet, Vicar Apostolic in Ava and Pegu.

The following is the passage in Chapter V. of the Bishop's translation :

“At that time‡ two brothers named Tapoosa and Palakat, merchants by profession were going with their carts from the village of Oo-kala to the country of Mit-zi-ma where Phra was then residing. A Nât who had been formerly their relative, stopped by his power the wheels of the carriages. Surprised at such a wonder, the mer-

\* The only place now in Bengal which I know with a name similar to this city, is Pundooa in the district of Hoogly.

† This date is 103 of the era established by king Thee-ha-noo, the grandfather of Gautama. It is equivalent to B. C. 588, or 45 years before Gautama entered Neib-ban.

‡ At this time Gautama is stated to have been a short distance West of *Bau-di-beng* or the sacred tree of Budh Gaya.

chants prayed to the Nât guardian of that place. The Nât assuming a visible shape appeared before them and said to them, "The illustrious Boodha who, by the knowledge of the four great truths has arrived to the nature of Phara, is now sitting at the foot of the Linloon tree; go now to that place and offer him some sweet bread and honey; you shall derive therefrom great merits for many days and nights to come." The two brothers joyfully complying with the Nât's request, prepared the sweet bread and honey, and hastened in the direction that had been indicated to them. Having placed themselves in a suitable position and prostrated before Boodha, they said; Most glorious Phra, please to accept these offerings; great merits, doubtless, will be our reward for many days to come. Boodha had no patta to put those offerings in, for the one he had received from the Brahma Gatigara had disappeared, when Thoodzata made him her great offerings. Whilst he was thinking on what he had to do, four Nâts came and presented him each with one patta, made of nila stone. Phra accepted the four pattas, not from motives of covetousness, but to let each Nât have an equal share in such meritorious work. He put the four pattas one in the other, and by the power of his will, they on a sudden became but one patta, so that each Nât lost nothing of the merit of his offerings. Boodha received the offerings of the two merchants in that patta and satisfied his appetite. The two brothers said to Boodha, "We have on this day approached you, worshipped you and respectfully listened to your instructions—please to consider us as your devoted followers for the remainder of our life." They obtained the position of Upa-tha-ka. They continued addressing Boodha and said, "What shall we henceforth worship?" Boodha, rubbing his hand over his head gave them a few of his hairs that had adhered to his fingers, bidding them to keep carefully those relics. The two brothers, overjoyed at such a valuable present, most respectfully received it, prostrated before Boodha and departed."

In the history of the Shwe Dagon Pagoda, this interview of the merchants' sons with Gautama, is expanded into a more particular narrative, to connect it with the fortunes of Pegu. The young men in reply to Gautama, state that they come from a far and obscure country, and the Lord Gautama reveals to them that his predeces-

sors the former Boodhas, had left in Pegu a bathing garment, a water dipper and a staff, hid in the Thein-goot-ta-ya Mount, under a wood-oil tree. Then giving four of the hairs of his head to each of the brothers, one of them he named Ta-poo-sa and the other Pha-le-ka, and charged them to deposit those hairs with the relics of the former Boodhas.

The two brothers then set out on their return, joined their ship at Ban-da-wa and sailed towards their own country. On the way they enter a port called D-ze-ta or E-za-ta,\* the King of which appropriates two of the hairs. They proceed on and cast anchor at Cape Negrais,† the Naga or Dragon of which, also demands two of the hairs. These are reluctantly yielded; after which, the brothers continue their voyage, and reach Oo-ka-la-ba in seven days. The eight hairs bestowed by Gautama are then found complete in the golden casket, in which they had from the first been deposited by the brothers.

The father and mother of the young men rejoiced exceedingly, saying, "Our children have indeed returned with heavenly treasure," and represented all that had occurred to the king of Oo-ka-la-ba.

The King with his Queen and nobles with the merchant, his wife and children proceeded to where the ship was, and received the relics with due honour. But no one could point out where Mount Thein-goot-taya was situated. At length the Guardian Nât of the Earth appears, and with his assistance the Mount is discovered, and the tree under which the former relics were deposited, was felled.

"Then the tree, (so proceeds the legend), as the three divisions of the Mount were not equal in height, remained poised horizontally on its centre on the highest peak; its top touched not the

\* These names cannot be recognized.

† The word Negrais has been adopted into European Geography through the old Portuguese voyagers. It no doubt is a corruption of the Burmese word "Naga-nheet" or "Naga-reet," as by the Burmese tradition the Naga, or Sea Dragon, there lies in wait to sink the ships of those unbelieving voyagers who pay him no respect.

ground, and its root touched not the ground. Therefore the place was called in the Mwon language 'Dagon.' \*\*

A shrine or relic chamber was then prepared under-ground, to receive the sacred relics, which were deposited therein with great ceremony, by the Nâts, the King, the Merchant Tha-ka-lai, now surnamed 'Thoo-wan-ná, and the inhabitants of the country. Numerous valuables, gold, silver and precious stones were also deposited in the relic chamber, and the golden model of a ship, with the two brothers holding the helm, floated miraculously, on a mimic sea. A small pagoda, not exceeding eighteen cubits in height, was then erected over the relic. The city then founded on the ground around the present pagoda, was called Oo-ka-la-ba. This is the first account of a place of worship being erected on the site of the present Shwé Dagon. The date of this event is stated to be 103 of the era established by Gautama's grandfather, or B.C. 588.

The dynasty of this Sovereign of Oo-ka-la-ba ceased after thirty-two generations, and the city of Oo-ka-la-ba and the Shwé Dagon Pagoda fell to ruins.

\* Much doubt has existed regarding the origin and meaning of the word *Dagon* as applied by the Burmese to the Great Pagoda at Rangoon. It has been supposed to be a corruption of the Pali word *Dagoba* from whence the European *Pagoda*, is, by transposition of the syllables derived. Several other supposed etymologies might be mentioned; but the name appears to be most probably derived from a word in the *Mon* or *Talaing* language. The obscurity in the meaning has resulted from that language having become nearly extinct in Pegu and from the Burmese authors of histories of the temple, seldom being acquainted with that language. The tree mentioned in the text appears according to the *Talaing* legend to have fallen "Tagún" or "Takún," that is *athwart* or across the hill, and to have been sustained horizontally in that position. The term *Tagún*, though strictly applicable to the object so placed across the hill, appears afterwards to have been used to designate the spot itself; and also the Pagoda built upon it, in commemoration of this remarkable event. The word has been changed by the Burmese into "Dagon" or "Dagún." The word Shwé, meaning Golden, is a translation of the original *Talaing* word prefixed to "Ta-gún." It is now used as a term indicative of excellence and respect.

The tree being sustained by the hill in the position mentioned was probably deemed to mark the original spot where the relics of former Boodhas had been deposited, and to indicate the destined site for the new Pagoda.

Subsequently in the year 514\* Tha-ma-la and Wee-ma-la, two brothers built a city and called it Han-tha-wa-tee. Their dynasty became extinct after twenty-seven generations and the city was abandoned. The city of Martaban was then built, and after seven generations the city of Han-tha-wa-tee was rebuilt. It was not until the reign of Ban-gya-ran in the year 808,† that anything was done to restore the Shwé Dagon Pagoda. The work was continued by his successors and in the Burmese year 863‡ a female Sovereign Sheng-tsau-boo, having succeeded to the throne, land was set apart, and hereditary servitors were appointed for the perpetual service of the temple.

At this time the height of the pagoda is stated to have been 86 cubits or 129 feet.

It cannot be credited that during the life of Gautama the Talaing people had through their own means, any communication by sea with India; or that Buddhism was introduced into the delta of the Irrawaddy at so early a period. The first building of a pagoda, on the site of the present Shwé Dagon, cannot from the Talaing or Burmese histories be fixed with certainty. Indeed the first reliable accounts connected with the pagoda in native history, are those which relate to occurrences in the reign of the Queen Sheng-tsau-boo, so late as the beginning of the sixteenth century of the Christian era. Since then the pagoda has from time to time been enlarged, and probably did not assume the beautiful form it now presents, springing majestically up to the height of 320 feet, until the reign of Tshen-phyoo Sheng, the son of Alompra. It is certain that in that King's reign the present *Htee* or spire was placed on the pagoda, about the Burmese year 1130 or A. D. 1768. Pegu the ancient capital of the Talaing kingdom being abandoned, after the conquest of the country by the Burmese under Alompra, it became the policy of the Burmese Kings to increase the splendour of the

\* This era is believed to be the era of religion established from the death of Gautama; 514 will therefore be the year 29 B.C. Han-tha-wa-tee is the old city of Pegu. It received its name from two birds Han-tha or Han-za being seen at the spot selected for the city. The Han-za thence became the emblem or standard of the kingdom of Pegu.

† A.D. 1446.

‡ A.D. 1501.



pagoda at Rangoon, so that it might surpass the ancient temple where the Talaings had for so many ages worshipped, and which was associated with recollections of their national independence. This no doubt prompted the Burmese to add to the size and beauty of the original building at Rangoon, and give it a Burmese form.

In the travels of the well known Mendes Pinto about the year 1545, he speaks of the city or port of Dagon, which no doubt refers to a city at or near, the present site of Rangoon. He makes no mention of the pagoda which he could scarcely have failed to do had it been of the size of the present building. The pagoda however appears to be mentioned by Gasparo Balbi a Venetian in 1583.

In concluding this notice of Shwé Dagon Pagoda, I purpose adding a few words on similar buildings in Burmah generally. They may be arranged into four classes, as follows :

1st. *Dat-dau Tsé-dee* or those containing relics of a Boodha or Rahanda.

2nd. *Pa-ree-bau-ga Tsé-dee* or those containing implements or garments which have belonged to Boodhas or sacred personages.

3rd. *Dhamma Tsé-dee*, or those containing sacred books or scrolls with texts.

4th. *Oo-deit-tsa Tsé-dee* or those built from motives of piety, and containing images of Boodha or models of sacred buildings generally in precious metal.

Hence in Burmah a pagoda is worshipped as being the depository of a relic ; a monument to Boodha ; or as representing *Dhamma* that is Divine Law.

The form of the most ancient pagodas in India appears to have been hemispherical, an expanded umbrella wrought in stone, being generally placed at the summit. Such was probably the shape of the original Shwé Dagon. Gradually however the form has been altered in Burmah, until the normal shape of a modern pagoda has become that of a cone, or circular pyramid of solid brick work, more or less ornamented, and crowned by a tapering spire of gilt iron net work. This is called the *htee* or umbrella.

The accompanying elevation of the Shwé Dagon Pagoda, exhibits the outline of that building and appended thereto are the terms used by the Burmese to designate the several parts of the fabric.

*Names used to designate the several parts of the building.*

| <i>Reference to numbers in the elevation.</i> | <i>Burmese name.</i>                                 | <i>Translation.</i>                                     | <i>Remarks.</i>                                                                                                                                                                                                                                                                |
|-----------------------------------------------|------------------------------------------------------|---------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1                                             | Bhe-nat dau.                                         | Sandal, being the base or plinth.                       |                                                                                                                                                                                                                                                                                |
| 2 to 3                                        | Pa-leng Khon or Pan-ten-gon or Pa-ta-má pits-tsa-ya. | Throne or pedestal; flower-stand or first gradation.    | The name flower-stand or receptacle is given, because the offerings of flowers are frequently laid upon this part.                                                                                                                                                             |
| 3 to 4                                        | Doo-te-ya pits-tsa-ya.                               | Second gradation or story.                              |                                                                                                                                                                                                                                                                                |
| 4 to 5                                        | Tá-te-yá pits-tsa-ya.                                | Third gradation or story.                               |                                                                                                                                                                                                                                                                                |
| 5 to 6                                        | Kyé-waing.                                           | Circular frame.                                         | A frame used to hold metal gongs which are used as musical instruments.                                                                                                                                                                                                        |
| 6 }<br>7 }<br>8 }                             | Khaung-laung.                                        | Bell.                                                   | This name is given from the general resemblance of the part to a bell. It is divided into two parts by a band called the girdle. (7) The portion below the girdle is more especially "the bell." The portion above is called "Thabeit mhounk," that is "inverted Monk's dish." |
| 8 to 9                                        | Phaung reet.                                         | Circular cornice.                                       | These are generally nine in number.                                                                                                                                                                                                                                            |
| 9 to 10                                       | Kya-lan.                                             | Lotuses reversed, with a circle of beads dividing them. |                                                                                                                                                                                                                                                                                |
| 10 to 11                                      | Nghet-pyan boo.                                      | Plantain bud.                                           | So named from being in the shape of that object.                                                                                                                                                                                                                               |
| 12                                            | Kyé-tsa-loung.                                       | Copper lid.                                             | Placed as a lid or cap at the top of the masonry.                                                                                                                                                                                                                              |
| 13                                            | Htee.                                                | Umbrella.                                               | The modern shape of this is derived apparently from the shape of the King's crown or cap of state. It is frequently called by the same name <i>Ma-gait</i> .                                                                                                                   |
| 14                                            | Tshap-thwa phoo.                                     | A tree so named.                                        | Name derived from the shape of the tree, or its bud.                                                                                                                                                                                                                           |
| 15                                            | Tsein bwen.                                          | Diamond blossoms.                                       | Ornaments so called.                                                                                                                                                                                                                                                           |
| 16                                            | Nghet-ma ná, or Nghet-myat ná.                       | The birds light not, or, the excellent birds light.     | Name for the vane.                                                                                                                                                                                                                                                             |
| 17                                            | Tsein phoo.                                          | Diamond bud.                                            | The highest part of the spire.                                                                                                                                                                                                                                                 |

*On the Great Rorqual of the Indian Ocean, with Notices of other Cetals, and of the Syrenia or marine Pachyderms.—By EDWARD BLYTH.*

The gigantic Whales (*Balænidæ*) of the intertropical regions of the ocean have been little studied. The existence of them is even ignored by Dr. J. E. Gray, in his elaborate synopsis of the known species of *Cetacea*, published in the Zoology of the Voyage of H. M. S. 'Erebus' and 'Terror' (1846), and again in the *Proc. Zool. Soc.*, 1847, pp. 88, 118; but there happens to be a very early notice of them at the northern extremity of the Arabian sea, in the narrative of the famous voyage of Nearchus, the Commander of Alexander's fleet which sailed from the Indus to the Persian Gulf *B. C.* 327. Not only did the ancient navigator encounter a troop of these huge animals; but it would appear that they were at that time not unfrequently stranded on the coast of Mekran, where the *Icthyophagi* of that woodless region used their bones for building purposes.\*

\* "The generality of the people live in cabins, small and stifling: the better sort only have houses constructed with the bones of Whales; for Whales are frequently thrown up on the coast, and when the flesh is rotted off they take the bones, making planks and doors of such as are flat, and beams or rafters of the ribs or jaw-bones: and many of these monsters are found fifty yards in length. Strabo confirms this report of Arrian; and adds, that the vertebræ or socket-bones of the back are formed into mortars, in which they pound their fish, and mix it up into a paste, with the addition of a little meal." Vincent's *Voyage of Nearchus*, p. 267.

Again, "Nearchus says, that on the morning he was off Kyiza or Guttar, they were surprised by observing the sea thrown up to a great height in the air, as if it were carried up by a whirlwind. The people were alarmed, and inquired of their pilot what might be the cause of the phenomenon; he informed them, that it proceeded from the blowing of the Whale, and that it was the practice of the creature as he sported in the sea. His report by no means quieted their alarm; they stopped rowing from astonishment, and the oars fell from their hands. Nearchus encouraged them, and recalled them to their duty, ordering the heads of the vessels to be pointed at the several creatures as they approached, and to attack them as they would the vessel of an enemy in battle: the fleet immediately formed as if going to engage, and advanced by a signal given; when shouting altogether, and dashing the water with their oars, with the trumpets sounding at the same time, they had the satisfaction to see the enemy give way; for

It is somewhat remarkable, however, that I have been unable to discover a single record, from the days of Nearchus to the present time, of the occurrence of great Whales in the Indian seas north of the equator; with the exceptions only of one huge fellow, described to have been 90 ft. in length and 42 ft. in diameter, which was stranded upon the Chittagong coast in 1842, another of 84 ft. in length, which was stranded upon an islet south of Ramri and east of Cheduba on the Arakan Coast in 1851 (as noticed by myself in the Society's Journal, *J. A. S.* XXI, 358, XXII, 414),—and to these two notices may be added the statement in the Rev. F. Mason's work on the Natural History of the Tenasserim Provinces, that—"The Whale is found south of Mergui, and Capt. Lloyd named a bay a few miles south of the parallel of 12° North, 'Whale Bay,'—from the circumstance, he says, 'of its being resorted to by numerous Whales, and its being the only part of the coast where I have seen them.'"<sup>\*</sup>

upon the approach of the vessels the monsters ahead sunk before them, and rose again astern, where they continued their blowing, without exciting any further alarm. All the credit of the victory fell to the share of Nearchus, and the acclamations of the people expressed their acknowledgment, both of his judgment and fortitude, employed in their unexpected delivery." *Ibid.*, p. 269.

"The simplicity of this narrative," continues Mr. Vincent, "bespeaks its truth; the circumstances being such as would naturally occur to men who had seen animals of this magnitude for the first time: and the better knowledge our navigators are possessed of, who hunt the Whale in his polar retreats, shews that he is sometimes as dangerous an enemy as he appeared to the followers of Nearchus."

<sup>\*</sup> I have since obtained information of one of the largest size which was stranded near Karáchi some years ago, and also of two during the present year (1859) in Ceylon, one near Galle, the other near Trincomali. Referring to Dr. Kelaart's *Prodromus Faunæ Zeylonicæ* (1852), we find it there stated that "Whales are very rarely seen. A dead one is occasionally stranded. The skeleton of one cast ashore, some twenty years since at Mount Lavinia, is still in the museum at Colombo." Sir J. Emerson Tennent, in his recent work on Ceylon, mentions their being frequently captured within sight of Colombo.

Since the above was written, I have received a letter from the Rev. H. Baker, Junr., of Alipi, S. Malabar, in which that attentive observer states—"Whales are very common on the coast. American ships, and occasionally a Swedish one, call at Cochin for stores during their cruises for them; but no English whalers ever come here that I have heard of. One said to be 100 ft. long was stranded on

They are, nevertheless, so far from being rare, indeed the sight of a shoal of these huge animals is so familiar a spectacle to mariners, that to this very circumstance—combined with the fact of their being of little commercial value—may be attributed the extraordinary absence of such memorial. Had the appearance of a shoal ('schule' or 'school' in nautical language) of enormous Whales in the Arabian Sea or Bay of Bengal been a phenomenon of unusual occurrence, it would unquestionably have been recorded from time to time.

From reliable information which I have obtained, I am enabled to state, with confidence, that they are still occasionally observed within the Persian Gulf,—rarely however in shoals, but generally one or two stragglers at a time. It may be concluded, therefore, that a shoal of them may yet be now and then seen off the coast of Mekran, at the head of the Arabian Sea a little further to the east, where Nearchus and his fleet encountered them; and that a carcass may still occasionally be stranded on the same rarely visited coast, and the bones even yet be applied to like purposes by the scanty fish-eating population of that inhospitable woodless region.

It appears, from much enquiry I have made on the subject, of competent observers, that only one species of Whale is met with in these seas, and all accounts agree that it is a 'Finner,' 'Fin-back,' 'Razor-back,' 'Pike-whale,' or Rorqual (*BALÆNOPTERA*), of enormous size. I cannot learn that a 'Hunch-back' (*MEGAPTERA* of Gray) has been observed north of the equator. An observant nautical friend writes word that "the Whale most generally seen in and about the Bay of Bengal, often in numerous herds, exhibits the dorsal fin; at least," he adds, "all that have come under my observation, and if my memory serves me correctly, the dorsal fin is about one-third or a

the coast. I saw some of the vertebræ and ribs about three years ago: last year, another, 90 ft. long, got among the reefs at Quilon, and was *murdered* by some hundreds of natives with guns, spears, axes, &c., and was cut up and *eaten* (salted and dried as well as fresh). The Roman Catholic fishermen of the coast pronounced it 'first chop beef.' The Maldives and Seychelles are said to be the head-quarters of the whalers who seek for these Whales. I am sorry I never noticed the jaw-bones sufficiently, for I saw them on the beach. We have the Dugong on the coast, and Porpoises come up the back-waters in March when they are salt, but the Susu I do not think is known here."

little more from the head and is well developed." To cite further communications of the kind would be mere repetition.

No other *Balenidæ* attain the dimensions of the largest *BALÆNOTERÆ*, including the known examples stranded within the Bay of Bengal; and the peaked dorsal fin is of itself a distinction. Moreover, the finless or 'Right Whales' are restricted to cold latitudes, where only, it would seem, they can obtain a sufficiency of their peculiar food: the Rorquals subsisting mainly on *Cephalopoda*. According to Scorseby, the great Northern or Greenland Whale (*B. MYSTICETUS*) "has never been seen beyond the limits of the Arctic Ocean." Another (*B. JAPONICA*, Gray,—*B. australis* of Temminck apud Gray,) descends more southward in the comparatively cold oceanic region of the Northern Pacific. In the southern hemisphere there would also appear to be two species (recognised as such by seamen with whom I have conversed),—*B. AUSTRALIS*, Desmoulins (*le Grand Balein du Cap*, Cuvier,—*B. antarctica*? Lesson),—and *B. ANTARCTICA* Gray, (vel *antipodum*, Gray, figured in Dieffenbach's 'New Zealand'). In the Timor seas, 'Black Whales' in addition to 'Sperm' are stated to exist in considerable numbers; but those 'Black Whales' I have been assured are 'Hunch-backs', which are much more nearly akin to the 'Finners' or Rorquals: though I suspect them to be a small kind of Cachelot subsequently noticed (*EUPHYSETES GRAY*).\*

\* The locality known as *Wal-visch* (i. e. 'Whale-fish') Bay, latterly spelt 'Walwich,' on the E. coast of S. Africa, is considerably within the southern tropic; but the name may well refer to Cachelots or 'Sperm Whales.'

In a short account of Timor, published in Moor's *Notes on the Indian Archipelago*, we read that the coast people of the island of Selvi (one of the Timor group) "are such expert fishermen that they constantly take the species of Whale called *Black-fish*, which are often 20 ft. long, and which afford oil inferior only to the spermaceti, having the same substance in the head as the Spermaceti Whale. They do not boil the blubber, but expose it to the sun in an inclined situation with a ditch at the bottom into which the oil drains." A small species of the *PHYSETER* group must be here intended; but the *Black-fish* of the Bay of Bengal is *GLOBICEPHALUS INDICUS*, nobis. As for the Sperm-whale fishery in the eastern seas, the Sulu or Mindoro Sea, between Borneo and the Philippines, in from 50° to 100° E. L., is at present I believe the grand resort of the whalers.

'Sperm Whales' were formerly hunted off the shores of the Antilles. Thus, the excellent observer, Mr. Richard Hill, of Spanish Town, Jamaica, writes to his friend

The *B. MYSTICETUS* is generally believed to be the largest of the true *BALÆNÆ*; and it rarely attains to 70 ft. long, according to a very high authority, the late Rev. Capt. Scoresby : but Mr. Polack, whose work on New Zealand contains much original matter concerning the great Cetals of the Southern Ocean, states that *B. ANTARCTICA* “not unfrequently attains the length of 70 ft., and the breadth where the flipper is placed (which is the thickest part) is often 18 ft. The female is invariably the larger.” *B. AUSTRALIS* is stated rarely to exceed 50 ft. in length. Again, the head in *BALÆNA* approaches to one-third of the entire length, while in the ‘Finners’ and ‘Hunch-backs’ it constitutes about a fourth. Lastly, the configuration of the chief bones of the ‘flipper’ or limb is very different in the *BALÆNÆ* to what is seen in the others, as shewn by Cuvier’s figures in the *Ossemens Fossiles*. These various considerations enable me to pronounce, with confidence, on the genus of the two great individuals which have been stranded, of late years, on the eastern shores of the Bay of Bengal.

The following notice of the 90 ft. specimen (as alleged), that was cast upon the Chittagong coast in 1842 (in about Lat. 21° N.), is taken from a letter that appeared in the ‘Friend of India’ newspaper for Sept. 15th of that year. It appears that “early on the morning of the 15th August, the attention of the people of Cox’s Bazar, and those of Muskal island, were attracted by something in appearance like a capsized hull of a large vessel, floating on the surface of the sea, coming towards the mouth of the Muskal river, and when it approached near the land they perceived that it was a living creature, by its continually spouting up water into the air, and by the middle of the day it cast itself on the shore of the west

Mr. P. H. Gosse, that—“Moreau de St. Meri, in his History and Description of the old French Colony of St. Domingo, relates that in his time (1785), in the months of March, April, and May, as many as five and twenty vessels from the North American States could be seen on the coast off Sale Trou near Jacmel, fishing for Cachelot Whales, and, he adds, for *Souffleurs* (*BALÆNOPTERA*) ; and that this fishery was with equal spirit pursued within the Gulf to the west of the colony ; —that is, within the bight, in which I saw the Cachelot breach. The whale-fishers resorted to Turk’s Island to boil their oil.” *A Naturalist’s Sojourn in Jamaica*, p. 353.

side of Muskal island. By the assistance of the flood and the surf of the sea, it was brought completely on shore, where, as soon as it was landed, it appeared to be in great distress; for it roared very loudly, similar to the roar of an old Elephant. As soon as all the Mugh inhabitants, both of Cox's Bazar and Muskal island, heard of the circumstance, they all sallied to the spot, and found that it was a large Whale. They then measured it, and found it to be 60 cubits (equal to 90 ft.) long and 28 cubits (equal to 42 ft.) in circumference. They then cut up the animal and each one helped himself to a large portion of the blubber, from which a quantity of oil was extracted. *Two flakes of its gill* [! flakes of *baleen*] were brought to me," remarks the writer, "which are indeed a great curiosity." The foregoing details were obtained from a Mugh Christian, who is not likely to have remarked the presence of a back-fin.

The other recorded example, stated to have been 84 ft. in length, was thrown up dead upon Juggu or Amherst islet, about 2° further south, during the rainy season of 1851. A few of the bones were collected in the following year by the present Major T. P. Sparkes, then Asst. Commissioner of Ramri, and were presented by him for the Society's museum. They consist of the two *rami* of the lower jaw, a right rib (probably the third of the series), the left *radius*, and five *vertebræ*. The proportional length of the *radius* indicates the animal to have been a *BALÆOPTERA* or Rorqual; while the remarkable slenderness of the lower jaw suffices to prove it a distinct species from any hitherto described Rorqual.

The only Whale, indeed, that I can find to bear comparison with it is one described in the *Philosophical Transactions* (Vol. I, 11), as cited by Dr. Gray, who refers it to his *MEGAPTERA AMERICANA*, founded upon the tracing of a drawing of a species stated to be common off the Bermudas (an almost subtropical locality). That Whale is thus described:—"Length of adult 88 ft.; the pectoral 26 ft. (rather less than one-third of the entire length); and the tail 23 ft. broad," &c. From the medium length of the *radius* of the Indian animal, the species must be very different,—in fact a *BALÆOPTERA* as distinguished from a typical *MEGAPTERA* or 'Hunch-back.'



But the lower jaw is remarkably slender for a *BALÆNOPTERA*, even more so than in *BALÆNA MYSTICETUS* (as viewed laterally, *vide Oss. Foss.* pl. XXVI, f. 9); while the coronoid process is well developed, as in Gray's figure of the lower jaw of *BALÆNOPTERA ROSTRATA* (*Zool. Voy.* 'Erebus' and 'Terror,' *Cetacea*, pl. 2); the base of the jaw, however, posterior to the process is not deeper as in that figure, but the reverse, and the jaw is proportionally much longer anterior to the process. The entire length of each *ramus* is within less than 2 in. of 21 ft., shewing the head to have been about a fourth of the total length. Vertical diameter, 3 ft. in advance of summit of coronoid, 18 in. (measured by callipers); at 3 ft. from tip,  $13\frac{1}{2}$  in.; and, where most contracted posterior to the coronoid, 15 in. only: extreme depth, at coronoid process (inclusively),  $26\frac{3}{4}$  in. From middle of coronoid to summit of condyle posteriorly, in a direct line,  $37\frac{1}{2}$  in. The shaft of the *ramus* is more approximatively of the same thickness throughout than in *BALÆNA MYSTICETUS*, tapering quite evenly.

The *radius* is  $38\frac{3}{4}$  in. long, nearly similar in shape to—but more curved than—that of *MEGAPTERA POESKOP* (*Rorqual du Cap*, Cuvier, *Oss. Foss.* pl. 227, f. 22, c.). The shape of this bone in *BALÆNA* (as figured by Cuvier) is remarkably different.

The rib is proportionally small, measuring only 8 ft. 2 in. round its curvature to superior articulation. It is probably the third of the series, on the right side.

Of the five *vertebræ*, two are dorsal, about the 6th and 7th; but they have been much hacked and are mutilated of their processes. Body of the *vertebra* (hind surface)  $11\frac{1}{2}$  in. deep by 15 in. broad. A lumbar *vertebra*, probably the first, has the body (measured posteriorly)  $13\frac{1}{2}$  by  $16\frac{1}{2}$  in. broad; antero-posterior diameter, 14 in.; spinal apophysis 27 in. (or a trifle more, allowing for the extreme tip which is broken off),—measured from the front, and sloping backward at an angle of nearly  $45^{\circ}$ .\* Another lumbar *vertebra*, probably the 5th or 6th, with spinal apophysis 8 in. in antero-posterior

\* In the figure of the skeleton of the great Northern Rorqual in the Volume on *Cetacea* in Jardine's *Naturalist's Library*, pl. V, the *apophyses* of the dorsal *vertebræ* are represented to slope forwards!

diameter, and lateral processes 12 in. long and  $8\frac{1}{2}$  in. broad. Lastly, a caudal (?) vertebra,\* about the 4th; the body (posteriorly) 15 by  $17\frac{1}{2}$  in. broad.

In *As. Res.* XV, *App.*, p. xxxiv, "a large jaw-bone of a Whale" is recorded as having been presented by Mr. J. Kyd, (1822-5). It was only the basal portion of one, and is now much injured by long exposure to the weather out-of-doors; but it appears to have belonged to a rather smaller individual of the same species, which I think we may safely venture on designating *BALÆNOPTERA INDICA*.

In *As. Res.* XVII, 624, and *Gl. Sc.* II, 71, "the vertebræ and cranium of a Whale" are recorded as having been presented by G. Swinton, Esq. (1830). These also are now much damaged and mostly valueless, from long exposure to all weathers,—the result of want of accommodation for such bulky specimens in our excessively overcrowded museum building. The length of this Whale was about 30 ft., of which the head was about a fourth. Probably the young of *BALÆNOPTERA INDICA*, rather than another and smaller species. A fine skull of the same, with *rami* of the lower jaw measuring 10 ft., was obtained by the late Professor H. Walker from a friend in Arakan, and is now in the museum of the Calcutta Medical College. It is most probably from the Bay of Bengal.†

There are other remains of *BALÆNIDÆ* in our museum, the origin of which I have been unable to trace,—at least when and by whom presented: but they were in the collection prior to my taking charge of it in 1841. Portions of one skeleton appear to be referable to *BALÆNA AUSTRALIS*, Desmoulins (*le Grand Balein du Cap*, Cuvier), or ordinary southern 'Right Whale.' These consist of three *vertebræ*, a pair of *humeri*, and a pair of *scapulæ*. One *humerus* and one *scapula* have now been injured by long exposure out of doors; but the others are in tolerably good preservation, and well agree with Cuvier's figures in the *Ossemens Fossiles*; the *acromion*

\* I mean one of the series with inferior 'V-bones' attached; not one of the small caudal that support the tail-flukes.

† In the Society's 30 ft. specimen, the bases of the lower jaw are mutilated, only the shafts remaining; but in the Medical College skull the coronoid, &c., of the lower jaw accord with those of our 21 ft. jaw.

being present only in the injured *scapula*. The *scapula* measures 41 in. long by  $47\frac{1}{2}$  in. in the extreme breadth. The *humerus* 22 in. long by 15 maximum and  $9\frac{1}{2}$  in. minimum breadth. Of the *vertebræ*, one is worked into a fancy chair, and is an uninjured first dorsal; body  $8\frac{1}{2}$  by  $10\frac{3}{4}$  in. broad, measured posteriorly; the lateral processes 12 in. long. Another is probably the third dorsal; and the remaining one is probably the fifth dorsal,  $13\frac{1}{2}$  by 14 in. posteriorly, and 12 in. in antero-posterior diameter: the spinal apophyses of both are broken away above their *alæ*. It will be understood that I merely adjudge these to be portions of the same skeleton.

Of two pairs of the internal ear of "The Whale," one pair is likely to belong to the last noticed individual, the other pair perhaps to the 30 ft. *BALÆNOPTERA*, which, however, is less probable, judging from their great size. It is not likely that they appertain to the same species, as one pair is nearly equal in size, while in the other the left is much larger than the right. From this great inequality, I am inclined to suspect that the latter pair belong to a Cachelot or 'Sperm Whale.' A large left internal ear, without a right to match it, is probably that noticed in *J. A. S.* V, 374, as having been presented by the late James Prinsep; and there is even another left *cochlea* only. On present data, I cannot venture on attempting to identify the precise species or even genera to which these specimens belong.

The Cachelots or 'Sperm Whales' (*Catodontidæ* of Dr. Gray), I humbly consider to constitute a subfamily rather of *Delphinidæ*; especially since the discovery of that very remarkable small species, the *EUPHYSETES GRAII* of Mr. W. S. Wall, Curator of the Australian museum, Sydney. That gentleman well argues the matter, in his 'History and Description of a new Sperm Whale,' &c., Sydney, 1851; of which he favored me with a copy. Unless the ear-bones before referred to belong to this group, we have only five teeth of a 'Sperm Whale,'—by whom presented I have been unable to discover.\*

\* Mr. Polack has a curious statement regarding the 'Sperm Whale,' to which I invite attention. He says—"The Cachelot is covered with an outer cuticle, as transparent as 'gold-beater's skin,' beneath which it is covered with hair per-

Of ordinary *Delphinidæ*, one of the most common species in the Bay of Bengal is that generally known as the 'Black-fish' to seamen, and named by me *GLOBICEPHALUS INDICUS* in *J. A. S.* XXI, 358. This was first noticed in XIX, 426; a large herd or 'school' (*i. e.* shoal) of these animals having been carried into the salt-water lake E. of Calcutta during the month of July, 1852. It is remarkable that two specimens which I have since obtained were procured during the same season of the year, *viz.* one taken in the Hugli near Serampore,  $6\frac{1}{2}$  ft. long (in 1858), and a newly born young during the present year (1859), which was brought to the Calcutta fish-bazar. The species is well distinguished from *GL. DEDUCTOR* of the Atlantic, of which we have a fine skull of an old animal for comparison. The inter-maxillaries of the Indian species are shorter and one-fourth broader, and the teeth are considerably stouter. Colour of the animal uniform leaden-black, slightly paler underneath. Length of an adult male 14 ft. 2 in.; the flippers 2 ft., and 6 in. in greatest breadth. Length of dorsal fin  $2\frac{1}{4}$  ft., and height 11 in. Breadth of tail-flukes 3 ft.; and from vent to cleft of tail 4 ft. 10 in. Adult female rather smaller. The skeleton of a female set up in our museum has a series of 49 *vertebræ*, additional to the united cervical. There are 11 dorsal or costal, 12 lumbar without the articulated 'V-bones,' 16 with the latter, and 10 small caudal within the tail-flukes. We possess skeletons of the adult male and female, the latter set up; the  $6\frac{1}{2}$  ft. example mounted as a stuffed specimen; and the new-born young as a skeleton. There is also a skull of this species in the museum of the Calcutta Medical College.\*

feetly sleek and black, covered with an uliginous matter, the texture and length resembling the clothing of the Seal tribe."

\* I had much trouble in securing our two skeletons of this fine Cetal. The animals were floundering about in all directions in the shallow water, and groaning painfully, *vide J. A. S.* XIX, 426. From what I afterwards learned, there must originally have been several dozens of them, which the natives towed off into the river as they died, having no notion of extracting oil from their carcases. The weather was terrifically hot; but I succeeded the first day in securing two pairs of the largest, male and female, and had them safely tied up towards evening for operations on the day following. They were all cut adrift during

There is a *GLOBICEPHALUS* also in the China seas, of which a description, with details of its anatomy, is published in the *Chinese Repository* for January, 1833, p. 411. The specimen (a male) was taken near Leu-chen; and, though designated *GL. RISSII* by its describer, is probably of a distinct species. Colour black above, lighter on the belly. Length  $9\frac{3}{4}$  ft. "Head 18 in. long, and average circumference 3 ft. There were only five blunt and eroded teeth in the lower jaw. The dorsal fin was triangular and almost immovable, 15 in. long; pectorals 14 in.; and all remarkable for their firmness and strength. \* \* \* This species does not spout a jet, though their breathing is distinctly heard at a short distance: they swim near the surface; and we had several opportunities of observing their habits during the voyage. The sailors term them 'Cow-fish.' "

Another small Cetal of which we possess a stuffed specimen is that described as *DELPHINUS PERNIGER*, Elliot, *J. A. S.* XVII, 250, from the Bay of Bengal: the species distinct from any of those described by Dr. Gray, and having the teeth proportionally large.

Of other Cetaceous remains, we have the Narwhal tusk presented by Mr. Lumsden (*As. Res.* XIV, *App.*); the skulls recorded in *J. A. S.* VIII, 969, from Greenland; and the two skeletons from Norway, *J. A. S.* XV, *Proc.* IX. Also two skulls of *STENO ROSTRATUS*, (Cuv.), one of an animal taken near the Nicobar islands, the other from the Red Sea: and a skull which seems to be that of *ST. ATTENUATUS*, Gray (*Zool. Voy.* 'Erebus' and 'Terror,' *Cetacea*, pl. 28), being probably that mentioned of "a Dolphin found near the Isle of France," *As. Res.* XII, *App.* XXIV. Lower jaw 14 in. Teeth  $4\frac{1}{1}$ . Another lower jaw, "from the High Seas," with series of 38 teeth, presented by Mr. C. Hervey, *J. A. S.* X, 937; and two skulls, toothless, and wanting the lower jaw, with series of 39 tooth-sockets. Length 15 and  $15\frac{1}{2}$  in. Origin unknown, but presented by myself. All of these would appear to be the same; but the left *ramus* of a lower jaw, with series of 43 teeth, is vertically much

the night; and the work had to be begun again: and I considered myself fortunate in succeeding so well as I did, in obtaining two perfect skeletons for the Society's museum.

deeper at the *symphysis*, and therefore undoubtedly appertains to a distinct species.

Also a skull according with *DELPHINUS EURYNOME*, Gray, and another with *D. OBSCURUS*, Gray; which, together with the Red Sea example of *STENO ROSTRATUS*, were made over to the Society's museum from that of the Calcutta Medical College in 1843. Lastly, the skull of a Dolphin affined to *D. DELPHIS*, L., and "procured during the voyage from England to India," *J. A. S.* XVI, 386. Presented by the late R. W. G. Frith, Esq., and probably an undescribed species. With a general resemblance to that of *D. DELPHIS*, the inter-maxillaries—united as far as the middle of the *rostrum*—are vaulted so that the section of their united middle portion forms a complete semi-circle, rising abruptly from the maxillaries, and being there only as broad as the exposed portion of each maxillary; probably a distinctive specific character. Teeth  $\frac{52-55}{50-50}$ . If confirmed as a new species, *D. FRITHII*, nobis.\*

Of the Gangetic 'Susu' (*PLATANISTA GANGETICA*), we have a stuffed male, presented by M. Alfred Duvaucel, *As. Res.* XV, *App.* xxxii. A stuffed female, and also a stuffed example of a young female, procured by myself. With skulls of adult male and female, the former toothless, and presented by Dr. Wallich, *As. Res.* XII, *App.* xxvi. The entire skeleton I have long been trying to obtain. There is a fine series of skeletons of this species in the museum of the Calcutta Medical College.†

\* Since the above was written, Capt. Jethro Fairweather, commanding the ship 'Forfarshire,' has favored us with the skull of a small but not young *STENO*, which seems to be *ST. ATTENUATUS*, Gray. It was procured not far from the Sandheads, out of an innumerable herd of them, "as far as the eye could reach in all directions," and was of a palish lead-colour,—not therefore, however, the *D. MALAYANUS* v. *plumbeus*, which is a much larger species common in the Bay.

Teeth  $\frac{39-40}{41-42}$

Major R. C. Tytler, also, has presented a skull taken W. of the Cape G. Hope, which agrees or very nearly so with the two heads *minus* the teeth and the lower jaw, mentioned in the text.

† Though abounding in the river Hugli, the 'Susu' is extremely difficult to procure, at least in the vicinity of Calcutta; and too often when a fine example is taken the captors saw off the *rostrum*, rendering it useless for a museum spe-

The skull of a 'Susu' from the Indus, presented by the late Sir Alexander Burnes, is of a conspicuously distinct species, which I designate

PL. INDI, nobis, *n. s.* Maxillary crests wanting in the specimen. Larger and much more robust than PL. GANGETICA, with the same number of teeth which are more than twice as stout as in the other, being much ground down by attrition in the specimen. Length of skull  $20\frac{1}{4}$  in.; greatest width at *zygomata*  $9\frac{1}{4}$  in.; depth of the two jaws, with teeth *in situ*, measured in the middle of their length,  $3\frac{1}{4}$  in.,—in PL. GANGETICA barely  $1\frac{3}{4}$  in. Length of *symphysis* of lower jaw 11 in. Depth of zygomatic arch  $2\frac{3}{8}$  in.

A coloured figure of probably the identical individual that furnished the skull above described occurs among the Burnes' drawings. The *rostrum* is represented as short in proportion to the length of the animal, and the neck to be more contracted than in the Gangetic species, which may be an error of the draughtsman. Colour also much paler, the lower-parts dull albescent, abruptly defined in a line from the gape to the tail-flukes. The specimen is evidently female; whence the male should have a longer *rostrum*. The dimensions assigned are "7 ft. long by 1 ft. 3 in. deep." Rudimentary dorsal fin as in the Gangetic species.

cimen. In what I believe to be the adult male, the *symphysis* of the lower-jaw measures 17 in.; in the adult female only 12 in.; the *rostrum* being thus 5 in. longer in the former.

The 'Susu' ascends very high up the rivers, if not quite to the foot of the mountains. Hardwicke's drawing was "made from a living specimen 1000 miles above Calcutta." Major Tytler assures me that he has seen them about 40 miles up the Jumna, and also at Raj-ghât Mundi in the Dehra Dhoon. Likewise in the Indus and Sutlej near Ludiana; but these were doubtless of the species proper to the Indus and its tributaries. The Gangetic 'Susu' is common throughout the valley of Asám, in the Bráhmáputra and its tributaries. Whether inhabiting the Irawádi and other Burmese waters I am unaware; but have been assured that no such animal exists there. From the minuteness of its eyes, this creature is obviously adapted for turbid rather than for clear water; and it has never been observed out to sea. It is migratory, as it occurs towards the Gangetic outlets only in the cold season, as remarked by Dr. Cantor; but at what particular season it is observed in the Upper Provinces I have been unable to ascertain.

Further information respecting the 'Susu' of the Indus and its tributaries is very desirable.\*

Of the *Syrenia*, or *Gravigrada* of de Blainville, the *Cetacea Herbivora* of the Cuviers (which Professors de Blainville and Owen have shown most satisfactorily to be much more nearly akin to the quadrupedal *Pachydermst*), we have only the genus *HALICORE* or *Duyong*. The skull and the lumbar and caudal portion of the vertebral column of an adult, I made out long ago to pertain to *H. AUSTRALIS*, Owen, the Australian *Duyong* as distinguished from that of the Indian seas, or *H. INDICUS*, F. Cuvier: but how we came by an Australian specimen was an enigma only very recently solved. In Corbyn's *India Review*, III, 46 (1838), there is a memoir of the late Dr. Robert Tytler, of the Bengal Medical establishment; and in this memoir we read that—"During his various expeditions, Dr. Tytler made some valuable collections of natural curiosities, of which he largely and liberally contributed to the Asiatic Society of Calcutta. In 1827, he read a paper on the *Duyong*, or *Dayoung*. The bones of four different individuals were picked up by Dr. Tytler at Raffles Bay, on the north coast of New Holland. In one instance they were sufficiently numerous to form nearly an entire skeleton of the animal. This creature is not uncommon in the eastern archipelago, but its existence on the coast of New Holland was made known for the first time by Dr. Tytler."—Hence, obviously, our bones of *HALICORE AUSTRALIS*.† I am not aware that it is yet generally known to zoologists that the *H. AUSTRALIS* differs

\* The existence of the *Susu* of the Indus, as a particular species, is referred to in Prof. Reinhardt's admirable paper on the Gangetic species, a translation of which (by the late Dr. Wallich) appears in the *Ann. Mag. N. H.* for 1852, pp. 162, 279, and *vide* p. 291. An excellent figure of the animal accompanies that paper.

† *Vide Proc. Zool. Soc.* 1838, p. 45, &c.

‡ The existence of a *Duyong* on the Australian coast was recognised so long ago as by Peron, in his account of the *Voyage of Discovery to Australia*, made by the *corvettes* 'Geographic,' 'Naturaliste,' and *goelette* 'Casuarina' (1800-4),—"edited by M. Francis Peron, naturalist to the expedition," and published in 1807. Dampier mistook them for *Hippopotami*; but he only saw a head, "half decomposed by digestion;" and the tusks doubtless helped to mislead him, for little in his time was known of *Hippopotami* beyond their tusks, our accurate acquaintance with this animal being still quite recent.



conspicuously in external colouring from *H. INDICUS* ; but such appears to be the fact from the following notice :—

Peron only saw a few teeth ; but he mentions one of these animals which “lay extended on the beach, of 20 to 22 *decimètres* [ $6\frac{1}{2}$  to 7 ft. English] in length, already half-decomposed by putrefaction, and which appeared to our sailors,” he adds, “so different from the *Phocæ*, that they thought they ought to bring its remains to me. Unable to bring the entire head, on account of the extreme stench which it exhaled, they tore from it seven teeth, which they offered me. It was easy for me to discover that these teeth belonged to a herbivorous animal. They proved, in fact, to be the teeth of a Dugon, a mammiferous sea-animal, but little known, and which appears to be confined to the Indian Ocean.” He then cites Leguat’s account ; but this worthy writer observed them at the Mascarine Islands (Mauritius, Rodriguez, &c.), where they are now, so far as I can learn, quite extinct, and the species may have been different,—perhaps that from the Red Sea, styled *H. TABERNACULI* by Dr. Rüppell : it may, however, still be found off Madagascar and the neighbouring coast of Africa.

Leguat, with his party of French protestant refugees, settled on the then uninhabited island of Rodriguez in 1691, and remained there for two years. His account is celebrated for the description of the now extinct ‘Solitaire ;’ and his accuracy in other matters has been established. He mentions Duyongs as inhabiting the shores of the Mascarine Islands “in great numbers. They attained to 20 ft. in length, and fed in flocks like Sheep in three or four fathoms’ water, making no attempt at escape when approached. Sometimes they were shot at the end of the musket, sometimes laid hold of and forced on shore. Three or four hundred were met with together, and they were so far from shy that they suffered themselves to be handled, and the fattest were thus selected. The larger ones were avoided, not only on account of the trouble they gave in the capture, but because their flesh was not so good as that of the smaller and younger ones.” (*Penny Cyclopædia*. Art. ‘Whales’.)

The *H. TABERNACULI* of the Red Sea, Dr. Rüppell “saw swimming among the coral banks on the Abyssinian coast near the Dalac Islands. The fishermen harpooned a female, which he dissected, 10 ft. long. The Arabs stated that they live in pairs or small families, that they have *feeble voices*, feed on *algæ*, and that on February and March bloody battles take place between the males, which attain to 18 ft.” &c. (*ibid.*)

Sir Stamford Raffles remarks that “the Duyongs are seldom caught at Singapore above 8 or 9 ft. in length ; but how much larger they grow is not ascertained, as, when they exceed that size, their superior strength enables them to make their escape.”

Barchemitz remarks, of those of Australia, that—“Each of these enormous *fish* is more than 21 ft. long ; the male is a little larger than the female : their heads resembled that of an Ox. They live upon a green grass which grows upon the banks.”

"In Morton Bay and on the neighbouring coast the aborigines eagerly pursue the Duyong, a species of small Whale, generally known to the colonists as the 'Sea-pig.' This animal has a thick smooth skin, with a few hairs scattered over its surface. Its colour is bluish on the back, *with a white breast and belly.*\* In size the full-grown male has never, we believe, been found more than eighteen or twenty feet long. The food of the Duyong consists chiefly of marine vegetables, which it finds at the bottom of inlets, in comparatively shallow water, where it is easily captured. Its flesh re-

Some of the sailors of the expedition that Peron accompanied were once "alarmed by a terrific howling which resembled the roaring of a bull, but much stronger, and seemed to come from the neighbouring reeds." This was near the Swan River; and it may be remarked that Mr. Fraser, in his description of the Swan River, when it was surveyed by Capt. Stirling in 1826, notices that-- "while attending to a boat on the river, I distinctly heard the bellowing of some huge animal similar to that of an Ox, from an extensive marsh further up the river." Peron justly remarks that "this terrific roar could only belong to one of those great animals which the Indian Ocean nourishes within its seas; but of all those with which we are acquainted, the Dugon alone presents analogous dimensions to the terrific noise which it makes."

Now the Arabs described to Dr. Rüppell that the Duyong of the Red Sea had a feeble voice!

The Australian Duyong is met with on the north coast of that island-continent, within the great barrier reef, at Swan River on the western side, and at Morton Bay on the eastern. It certainly appears to be a distinct species from that of the Malayan seas; but additional species to these two are less satisfactorily established, and the total disappearance of these animals from the vicinity of the Mascarene Islands is worthy of attention, and may be borne in mind with reference to the extraordinary fact of the seeming extinction of the *Rytinus Stelleri* in the N. Pacific. We want information, however, respecting Duyongs at the various coral groups of the Indian Ocean, within ten or twelve degrees of the equator. The same species may well inhabit the whole of them. It is remarkable that the Malays consider that two species of these animals exist. *Vide Proc. Zool. Soc. 1838*, note to p. 43.

\* M. F. Cuvier figures the Malayan Duyong of an uniform pale slaty or plumbeous colour, with some darker blotches on the sides. In the Atlas to the Voyage of the *Astrolabe*, the Duyong is figured of a pale fulvous hue with white under-parts, which laterally are blotched with the colour of the back. Hardwicke figures it of an uniform slaty-black, albescent on the head (unless this be meant for *shine* or reflected light). There is a wood-cut shewing the mode in which the female carries her young in Sir J. E. Tennent's work on Ceylon.

sembles good beef, and is much esteemed. The oil obtained from its fat is peculiarly clear and limpid, and is free from any disagreeable smell, such as most animal oils are accompanied with. It has not yet been produced in sufficient quantities to acquire a recognized market value. The blacks devour the carcase of the Duyong roasted, after expressing the oil for sale to the colonists.”\*

Of the Indian Duyong we possess a small stuffed specimen, presented by the Batavian Society in 1845; and the lower jaw, *scapula*, and four ribs of a larger but still young individual, recently found in an Andamán hut. The Andamán islands are the most northern locality as yet ascertained for the species in the Bay of Bengal; and it must be rare there, or the bones would more frequently be found to decorate those rude lairs (huts they cannot justly be termed, together with the skulls of the small *SUS ANDAMANENSIS* and of Turtles. On the west coast of Ceylon, Mr. Layard notices that Duyongs are common in the Gulf of Calpentyu; the flesh of this animal being there also held in esteem. Sir J. E. Tennent, again, remarks their occurrence in all the salt-water inlets from the Gulf of Calpentyu to Adam's Bridge. They are found likewise along the shore and in the salt-water inlets of the Concan, where, as not long ago ascertained by the Rev. J. Baker, Junr., of Mundakym, Alipi, on that coast, they are known to Europeans as “the Seal.” That gentleman took some pains to discover what the animal could be, and found that it was the Duyong, which came to feed on the vegetable matter found about the rocks, as well as to

\* ‘The Three Colonies of Australia’ (p. 337). By Samuel Sidney. London 1852. In a recent anonymous work, entitled ‘Rambles at the Antipodes,’ &c. (1859), the Duyong is mentioned as the *Yangan* of the aborigines. This author, like every other (from the time of Sir Stamford Raffles and before), describes the meat of the Duyong to be excellent. “When fresh having the taste of tender beef, and when salted nearly resembling bacon.” Hence, perhaps, the appellation ‘Sea Pig.’ The Duyong, it is added, “yields an oil, which is found, in cases of scrofula and other diseases, to be more efficacious than cod-liver oil.” The latter would seem to be rising in demand; worse luck for the animal! A friend informs us that it is most difficult to obtain even a portion of Duyong meat at Malacca; as, no sooner is a specimen captured, than it is at once cut up and cooked by the Malays. Hence the difficulty of obtaining museum specimens.

bask and sleep in the morning sun (!). Forbes, in his 'Oriental Memoirs,' gives an account of these so-called 'Seals' as "abounding in the salt-waters of Travancore;" but his description of them is either inaccurate, or it must refer to some other animal (which is exceedingly unlikely). He says—"The Travancore Seal has a round head, *short ears*, thick neck, tapering body, and flat tail, like a fish; it is web-footed, and *the skin covered with a soft oily hair*. Seals," he adds, "vary in size and appearance in different countries: at Anjingo they seldom exceed 4 ft. [!] in length: they are gregarious and sociable; form parties on the banks of the rivers, but always plunge in at the approach of a stranger." (2nd edition, I, 227.)

In our Andamán specimen of a lower jaw, the first molar has a minute forked crown and proportionally very large root. Then follow three deciduary pre-molars, ground to a perfectly flat surface; and behind these a tuberculated permanent molar, which had nearly pierced the gum when the animal came by its death.

A complete skeleton of an adult Duyong would be extremely acceptable for the Society's museum; no matter how roughly prepared, provided no bones are wanting. Skulls, also, of adults of both sexes are desirable.

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#### LITERARY INTELLIGENCE.

The following is extracted from a letter to Dr. W. N. Lees from Mr. Wright of Dublin, dated 16th October, 1859.

"I do not think that I have ever written to you to thank you for your last present, the *Introduction* to the *نفسات الانس*. In my last parcel from Williams and Norgate I have just received the *Persian text* of that work, and the 3rd and 4th vols. of the *Kash-sháf*; which I was glad to see is advancing so rapidly. At home but little of consequence has been done in the Arabic line, excepting *Wüstenfeld's Histories of Mecca (el-Azraqi, Kotb-al-dín, &c.)* and *Life of the Prophet* by *Ibn Hishám*, and an edition of *Mutanabbí* by *Dieterici* of Berlin. *Sprenger* is busy with his life of Mohammed, as I see from his last letter to me. A volume has lately appeared at Gotha, containing a catalogue of the *Persian MSS.* there, by a young scholar named *Pertsch*. *Vuller's Persian Lexicon* seems to

have come to a stand still. In Sanskrit I can announce the issue of *Max Müller's* History of early Indian Literature (on the Veda and the works connected therewith). *Aufrecht* has published within the last year an edition of the *Unádi-sútras* with *commentary* by *Uj्जvaladatta*, and is now editing a small lexicon by *Haláyudha*. Both works are accompanied by glossaries and notes. The first vol. of his *catalogue* of the *Sanskrit* MSS. in the Bodleian Library ought to appear by the end of this year, I think, if the curators assent to its separate publication. I hope you have received copies of the 1st vol. of my Arabic Grammar, which I directed Williams and Norgate to send to you. I am now busying myself with the 2nd vol., which should appear in the course of next year. I am also just making up a list of corrections on my vol. of *Al-Maḥḥarí*. The 5th and last part of the work (Indices and corrections) will go to press shortly. *Dozy* is, I may mention, just bringing out a new edition of his "*Recherches sur l'histoire &c. de l'Espagne*," more popular in style than the 1st vol. was, and contained in two vols. 8vo. The work will probably be translated into English. This is, I think, all the literary news with which I can at present furnish you. Wars and rumours of wars render literature as flat as merchandize."

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Dr. Sprenger writes from Berne in a letter dated 31st October.

"You have of course seen Wright's translation of Caspari's Arabic Grammar. It is admirably done and much required. It is a great pity that oriental scholars in India never learn the rudiments of the oriental languages. The consequence is that, wherever criticism and European mind are required, they are completely out, and their Moonshees are of no great use in such cases. Lane is advancing fast with his gigantic Arabic Lexicon. Else I believe there is not much doing in England. In France Mons. Renan begins a new epoch,—he is a man of genius and extensive learning, and instead of quarrelling about words and letters as the school of De Sacy used to do, he enters into the spirit of the ancient history of the East. There are some excellent contributions of his in the *Revue Germanique*, a periodical which you ought to have. Slane is at Paris and engaged with translating Ibn Chaldún's Philosophy of history, the text of which has been edited by Quatremère. It

is the most remarkable book in the Arabic language. The doings of Germany you learn from the *Zeitschrift*. Dr. Juynboll is engaged with bringing out Ibn Hawqal's Geography. He works conscientiously, but it would be a mercy if he would spare us his erudite notes. In that respect the edition of Ibn Batúta is a pattern—exact and critical without childish show of erudition. Amari, a noble fellow, who was in 1848 a member of the provisional Government of Sicily, is going as Professor of Arabic to Florence, and it is to be hoped that, under his influence, oriental literature will make progress in Italy. His book on the history of the Arabs in Sicily is a work of great merit. Professor Dorn of St. Petersburg is engaged with a history of the Persian provinces on the Caspian Sea and was last summer in England to collect materials."

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In Sanskrit Lexicography Messrs. Böhtlingk and Roth have completed the letter **ह**, and Dr. Goldstucker has issued a 3rd part of his voluminous undertaking which reaches to the word **अभिचिद्य**. We regret to find that the unwieldy plan with which he commenced, becomes only more and more gigantic with every fresh fasciculus. The last part (containing 80 pages) only corresponds to *ten* pages of Wilson's second edition.

Prof. Behrnauer of Vienna is engaged in bringing out an edition of Abu Schamah's **كتاب الروضتين** which he is publishing also in the Bairut Journal, entitled **حديقة الاخبار**.

The breaking up of Capt. Tripe's establishment by the Madras Government is a step which will be regretted by all who take an interest in Indian antiquities. It is gratifying, however, to hear that he has completed photographs of the curious Buddhist sculptures which were brought to Madras several years ago by Mr. Walter Elliot from Dipaldinni on the Kistna, as well as of the temples and remains at Madura. Capt. T. succeeded also in taking a photograph of the ancient Tamil inscription round the base of the great temple at Tanjore. Is it too much to hope that Col. A. Cunningham, to whom, we are aware, Mr. W. Elliot has forwarded a copy of the drawings, will give us his interpretation of the Buddhist sculptures?

Syud Ahmed's Oordoo account of Delhi, published some four years ago, is being translated by M. G. de Tassy and will shortly appear either in the *Journal Asiatique* or the *Revue de l'Orient*.

## NOTICES OF NEW WORKS RELATING TO SANSKRIT LITERATURE.

*Ujjwaladatta's Commentary on the Uṇādi Sūtras, edited from a MS. in the Library of the E. I. H.—By THEODORE AUFRECHT. London, 1859.*

The Uṇādi Sūtras are well known in connection with one of the most interesting questions discussed by Indian grammarians, viz. whether it be possible or not to derive all nouns from verbal roots. On the one hand Gārgya and Patanjali deny it, while Yāska and Śākaṭāyana maintain the affirmative.\* The Uṇādi Sūtras are a very old attempt to carry out the latter principle, by inventing a system of rules to explain those words which, if derived from a verbal root at all, have diverged from any direct connection with its meaning,—and in some instances from all apparent connection direct or indirect, as in ‘nāku,’ an ant-hill, from ‘nam’ to bend, or ‘mayūra,’ a peacock, from ‘mi’ to hurt. Fanciful as many of these derivations may seem, they at any rate are conducted on a system and principle, and are thus far superior to the random guesses of the Greek grammarians, as in the Etymologicum Magnum.

The Uṇādi Sūtras are older than Pāṇini (i. e. 300 B. C.) as they are thrice quoted in his Sūtras (iii. 3. 1, 2. iii. 4. 75.) and it is not improbable that they may have been composed by Śākaṭāyana. They derive their name from the affix, which is mentioned in the initial sūtra, “*kṛi-vá-pá-ji-mi-swādi-sādhy-as’úbhya un.*”

Dr. Aufrecht has given us a very valuable edition of these Sūtras with an hitherto unpublished commentary. The only previous edition had been that in the Siddhānta Kaumudī with a commentary by Bhaṭṭoji Dīkshita (reprinted by Dr. Böhtlingk, 1844), but both the edition and its reprint were marred by innumerable errors, and many of the worst description. The present commentator is earlier than Bhaṭṭoji, his age being fixed between two limits. ‘He very frequently quotes Mahéswará Vīswaprakāsa, a lexicon written A. D. 1111, and is in his turn mentioned by Rāyamukūṭa, who composed his commentary on Amara in 1431.’ (Dr. Aufrecht’s preface, p. xiv.)

The Uṇādi Sūtras (like the Prākṛit Sūtras of Vararuchi) have suffered by interpolations of examples and even whole rules, and

\* See Prof. Müller’s Ancient Sanskrit Lit. pp. 164-169.

many words at present appear in them which can hardly be reconciled with such an early date. Dr. Aufrecht mentions two, ‘*dīnāra*’ (3. 140) and ‘*mihira*’ (1. 52), which are evidently connected with the Latin *Denarius* and the Persian *mīhr*. But in the first of these instances Ujjwaladatta most satisfactorily explains the anomaly. In the Sūtras as given in the Siddhānta Kaumudī, we read दोडे नु च ॥ दोनारः सुवर्णाभरणं ॥ but in Ujjwaladatta’s earlier recension we have the following valuable addition दोडे नु च ॥ दोङ् चये । अस्त्रादारन् प्रत्ययस्य नुडागसस्य । दोनारः सुवर्णाभरणं । सुवर्मिदं सूतीवृत्तौ देववृत्तौ च न दृश्यते ॥ “after the root ‘*dīng*’ in the sense of ‘destruction,’ the suffix *ūran* is employed with the augment *n* (*nut*), as *dīnāra*, ‘a golden ornament.’ This Sūtra is not found in the Deva and Sūti commentaries.” The same remark is made in several other places.

In the editions hitherto printed, ‘besides many other faults, sūtras were often given as commentary,\* and the commentary turned into sūtras’ (Pref. p. xx.) ; these faults are here all corrected, and we have now an edition of this very valuable part of ancient Indian Grammar which criticism may safely depend upon. At the end, the editor adds a very useful philological Glossary, and a list of the principal Unādi suffixes which actually occur in Sanskrit. From the latter we extract the following,—the Sanskrit accent being marked by the Italic letter ; “*u*,—the oldest suffix of the Indo-Germanic languages. Ex. á’su *ὠκύ*, *uru* *εὐρύ*, *guru* *βαρύ*, *tanu* *ταρύ*, *pas’u* *pecu*, *puru* *πολύ*, *prithu* *πλατύ*, *bahu* *παχύ*, *báhu* *πῆχυ*, *madhu* *μέθυ*. Compare in Latin *genu*, *veru*, *curru*, &c.”

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*Pantschatantrum sive quinquepartitum de moribus exponens, ex Codd. MSS. edidit J. G. L. KOSEGARTEN. Pars II. 1859.*

Professor Kosegarten has here given, as a sequel to the first part published several years ago, a more ornate version of the stories of the Panchatantra. Beside the occasional *purpurei panni* of rhetorical description which are inserted here and there, we also find several variations in the stories themselves, and many of them ap-

\* Thus in Böhtlingk’s ed. p. 15, we have in 1, 129, a new sūtra *drināteh shugghraswas’cha* disguised as part of the comm.



pear to bear a closer resemblance to those in the *Kalīla wa Dīnna*. The present fasciculus contains the first nine fables of the first book.

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*Zwei Vedische Texte über Omina und Portenta von A. WEBER.*  
1, *Das Adbhuta Brāhmaṇa des Sāma Veda.* 2, *der Adbhutādhyāya des Kaus'aki-sūtra.* Berlin, 1859.

Dr. Weber in this brochure has given us the text of two Vedic works on omens and portents, accompanied by a translation and running commentary. The papers were read before the Royal Academy of Berlin, on the 10th and 24th of June, 1858, and they are now republished from the Academy's Transactions.

The *Adbhuta Brāhmaṇa* is the concluding part of the *Shadvin'sa Brāhmaṇa* of the *Sama Veda*, and consists of twelve sections. Each section (from the 3rd) gives a formula to avert certain inauspicious phenomena,—each being directed to a different deity. The first is to be directed to the East and belongs to Indra, the second to the South and Yama, the third to the West and Varuṇa, the fourth to the North and Vāisravaṇa, the fifth to the Earth and Agni, the sixth to the Atmosphere and Vāyu, the seventh to the Sky and Soma, the eighth to the highest Heaven (*param divam*) and Viṣṇu, the ninth to the nether Quarter (*adhastād dis'am*) and Rudra, the tenth to every Quarter and to Sūrya. The two last are not found in some MSS. and are probably a later addition.

One of the most remarkable passages in this *Brāhmaṇa* is that which mentions certain portents connected with the temples and *images* of the gods (§ 10).

देवतायतनानि कम्पन्ते दैवतप्रतिमा हसन्ति गायन्ति नृत्यन्ति स्फुटन्ति खिद्यन्त्युन्मोलन्ति निमोलन्ति । “If the temples of the gods are shaken, or if the images of the gods laugh, sing, dance, burst, sweat, open or close their eyes.”

Dr. Weber appears, by his note on § 5, to entertain some doubt as to *patanṅga* meaning a ‘grasshopper’ as well as ‘a bird;’ but in the *Kumāra Sambh.* iv. 20, Mallinātha expressly explains it by *S'alabha*.\*

\* The line in the K. S. is easily understood by any one who has seen his lamp covered with the pharīngas (ফড়িঙ্গ) of Bengal.

The Bráhmava is followed by the 13th book of the Kaus'ika S'útras, which treats the same subject in a much fuller manner. The rules, however, are here given without any apparent order or method, and Dr. Weber argues for them a higher antiquity.

One of the most interesting passages is that which gives the formula to be used in case two ploughs become entangled. In the hymn here used we find a direct personification of the *furrow*, *Sítá*,—"black-eyed, bearing a lotus, beautiful in every limb, decked with a golden garland, the golden wife of Parjanya, the god of rain." Two of the most living creations of the later Indian muse are thus dissolved by modern criticism into ancient personifications of natural objects,—the *Sítá*\* of the Rámáyana into the Vedic ploughman's 'furrow,' and the *Urvasí* of Kálidása into the dawn which awoke him to his daily toil!

\* Cf. Rám. i. 66.

अथ मे दृषतः चेन्नं लाङ्गलादुत्थिता ततः ।  
चेन्नं शोधयता लब्ध्वा नाम्ना सौतेति विश्रुता ॥

#### ERRATA IN VOL. XXVIII.

P. 4. l. 19, *for* opposition *read* apposition.

P. 28. l. 2, *infra*, *for* हर्षो *read* हर्षो.



PROCEEDINGS  
OF THE  
ASIATIC SOCIETY OF BENGAL,  
FOR OCTOBER, 1859.

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The Monthly General Meeting of the Asiatic Society was held on the 12th instant.

A. Grote, Esq., President, in the chair.

The proceedings of the last meeting were read and confirmed.

Presentations were received.

1. From the Superintendent of the Ordnance Survey Office, Southampton, a copy of the account of the Principal Triangulation of the United Kingdom.

2. From the British Association for the Advancement of Science, Report of the 27th Meeting of that institution.

3. From the Royal Asiatic Society of London, Vol. XVII. P. 1, of the Journal of that Society.

4. From Prince Mahomed Buhram Shah, two copies of Marshman's History of India, translated into Persian by Abdurraheem.

5. From Dr. G. Buist—A series of specimens of the rocks around Point de Galle. These (Dr. Buist states) were of granite, fresh and decomposed, for the most part devoid of hornblende or mica. They abounded in crystals of cinnamon stone, and scales of iron glance. The specimens shewed the rock in all its stages of decomposition. Passing on the one side to kaolin, on the other to laterite, the quartz in both cases slowly resisting change, but becoming absorbed in the general earthy mass at last. The laterite again was in many cases concentrating its iron into a red-black oxide. In some it had been broken up, and re-cemented into a conglomerate.

6. From R. Swinhoe, Esq., of H. M. Consulate, Amoy—A collection of Chinese bird skins, arrived but not yet received, in consequence of the closure of the Custom House during the Durga puja holidays.\*

7. H. M. the ex-King of Oudh. A snake, *DENDROPHIS ORNATA*.

8. Prince Mahommed Jalaludin, of Baligunge. A snake, the Raj-samp of the Bengalis, *BUNGARUS ANNULARIS*.

9. Dr. Crozier, two skulls of Horses.

10. Capt. W. H. Lowther, in command of the 1st Assam Local Battalion. The skin of a Binturong, *ARCTICTIS BINTURONG*, killed on the Singpho frontier of Upper Assam, where termed by the natives *Young*. Interesting with reference to the geographical distribution of this remarkable animal.

11. Baboo Rajendra Mallika, the carcass of a four-horned sheep the skull of which has been retained for the museum.

12. Capt. Eales, commanding the *Fire Queen*, the following specimens from Port Blair: A fish, *JULIS LUNARIS*, in spirit, and stuffed specimens of two other fishes, *TETRODON PUNCTATUS*, and a large undetermined *MURAENA*.

13. Capt. Hodge, commanding the guardship *Sesostris*, at Port Blair. Another considerable collection of fishes, a few birds, comprising a Parrot hitherto only known to inhabit the Nicobar Islands, two harmless snakes, *LYCODON AULICUS var*, and a young *DIPSAS*, and of mammalia a nearly perfect skeleton of *SUS ANDAMANENSIS*, another imperfect skeleton of a young Pig from the Nicobar islands, which appears to be the young of the ordinary domestic race, portions of the skeleton of a *Paradoxurus*, the particular species undeterminable, and the skin of a peculiar Rat.

The following gentlemen duly proposed at the last meeting were balloted for and elected ordinary members:—

Dr. C. Archer, Captain J. C. Haughton, Supdt. Port Blair (re-elected), A. Fisher, Esq. Dr. G. K. Hardie, L. B. Bowring, Esq. (re-elected) D. Fitzpatrick, Esq. c. s., Captain Forlong.

The following gentlemen were named for ballot as ordinary members at the next meeting:

\* Since received.

Major S. R. Tickell, Maulmain, proposed (for re-election) by Mr. W. S. Atkinson, seconded by the President.

J. Sanders, Esq., proposed by Mr. E. B. Cowell, seconded by Mr. Woodrow.

C. A. Elliott, Esq. c. s., proposed by Mr. Atkinson, seconded by the President.

The Council proposed Dr. Frederick of Batavia as a corresponding member of the Society.

Communications were received.

1. From Col. Baird Smith, c. B., officiating Secretary to the Government of India, a memorandum on the Irrawadi River by Lieut.-Col. A. Cunningham, Bengal Engineers.

2. From Baboo Radanath Sikdar, abstract of the Meteorological Observations taken at the Surveyor General's Office in the month of April 1859.

3. From R. Davies, Esq. Secretary to the Government of the Punjab a paper containing remarks on the Cataclysms of the Indus by Capt. Montgomerie, Bengal Engineers.

The paper was read by the Secretary. It will be published in the Journal.

Dr. Buist, Bombay, read a paper on the *Curia muria* islands to which remarkable group an unusual amount of attention had of late been drawn from their being represented as containing deposits of guano. They were five in number, situated in a fine semi-circular bay on the Southern shore of Arabia, betwixt the Sea of Oman and the Gulf of Aden, under the seventeenth northern parallel and fifty-seventh eastern meridian. This was the stormiest portion of the Arabian sea, subject at all seasons to violent storms of wind and rain, the occurrence of the latter forbidding the idea of guano being stored of any considerable commercial value. Though two degrees south of Bombay where  $58^{\circ}$  was a degree of cold rarely known, the Belot or Belood wind from the mountains to the west often brought down the thermometer to 40 degrees.

The islands are mostly plutonic, consisting of granite, porphyry and hornblende rocks, corresponding with those on the mainland

opposite the summit of the magnificent cliff on the northern shore of Hullany, where it springs up 1645 ft. above the sea, of tertiary limestone full of marine remains, similar to those prevailing in Egypt, Scinde, and the Punjab: the islands are nearly waterless, and are barren in the extreme. In 1835, when the islands were surveyed, the whole population consisted of thirty-five individuals nor have we any reason to suppose that they have since then been on the increase. They belonged to a considerable tribe on the mainland, who had always considered the Curia murias their own. A Mr. Ord roving in these seas in 1853 professed to have discovered enormous deposits of guano on the Curia muria, and ignorant of, or ignoring, the fact that this must needs have been rendered worthless by the rains, he so far gained the ear of Lord Clarendon that in 1854 H. M. S. *Juno* was commissioned to ascertain the fact. Subsequently the Imam of Muscat was applied to, to cede the islands, he having as much right to them as to make over Wight, Anglesey, or Sky to France. We were now arranging for the Red Sea Telegraph, and the time was most inopportune for disturbing the minds of the people on the sea board of Southern Arabia. Mr. Ord having appeared to claim execution of the treaty represented himself as having been resisted and threatened by hordes of natives. Accordingly a war steamer of the Royal Navy burning coal at £3 a ton, was sent out 30,000 miles, both to manifest the power and vindicate the honor of England against an enemy not numbering in all *ten* adult males—naked and unarmed as at the hour of their birth. It is needless to add that hostility or resistance were never dreamt of by a handful of harmless barbarians who had nothing to do but surrender at pleasure. But then the people of England were assured of their triumph, and the guano speculators were promised fortunes. Since 1857 shipping to the extent of 80,000 tons has visited the Curia murias, and the adventure utterly hopeless from the first, has in man-of-war and merchant-shipping charges probably occasioned a loss to the Commonwealth of not less than a quarter of a million sterling. In reality there is a small quantity of guano of excellent quality found in caves and crevices where the rain never reaches and the reports of the chemists on this mislead as to the remainder.

The thanks of the meeting were voted to Dr. Buist for his interesting communication.

The Officiating Librarian submitted the usual monthly report.

#### LIBRARY.

The Library has received the following accessions since the Meeting in September last.

#### *Presentations.*

Account of the Principal Triangulation of England, with a vol. of Plates.  
—BY THE ORDNANCE SURVEY OFFICE.

Report of the British Association for the advancement of Science for 1857.—BY THE ASSOCIATION.

Tareekhê Hindosthan, being a Translation of Marshman's History of India in Persian, 2 vols.—BY PRINCE BUHRAM SHAH.

The Oriental Christian Spectator for September, 1859.—BY THE EDITOR.

The Oriental Baptist for October, 1859.—BY THE EDITOR.

The Calcutta Christian Observer for October, 1859.—BY THE EDITOR.

The Athenæum for July, 1859.—BY THE EDITOR.

Proceedings of the Royal Society, No. 35.—BY THE ROYAL SOCIETY OF LONDON.

The Atlantis, No. IV. for July, 1859.—BY THE MEMBERS OF THE CATHOLIC UNIVERSITY OF IRELAND.

Monographie des Guépes Sociales par Henri de Saussure cahiers 10 and 11, with two plates.—BY THE AUTHOR.

Official Correspondence on the System of Revenue Survey and Assessment in the Bombay Presidency, 1859.—BY THE BOMBAY GOVERNMENT.

Bijdragen tot de Taal-land-en Volkenkunde von Nederlandsch Indie, Tweede deel, Derde Stuk.—BY THE BATAVIAN SOCIETY.

Proceedings of the Royal Geographical Society of London, No. IV.—BY THE SOCIETY.

#### *Purchased.*

Literary Gazette, Nos. 55 to 59.

Methode pour etudier la langue Sanscrite. Par E. Burnouf.

Annales des Sciences Naturelles, Tome X. No. 5.

Deutsches Wörterbuch von Jacob Grimm und Wilhelm Grimm. Dritten Bandes Zweite Lieferung.

Mutanubbii Carmina cum Commentario Wahidii. Fasciculus Tertius.

The American Journal of Science and Arts for July, 1859.

The Quarterly Journal of the Geological Society for August, 1859.

The London, Edinburgh and Dublin Philosophical Magazine and Journal of Science for August, 1859.

The Annals and Magazine of Natural History for August, 1859.

Comptes Rendus, No. 26 of Tome 48 and Nos. 1, 2 and 3 of Tome 49.

Grammaire Sanscrite par Jules Oppert.

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FOR NOVEMBER 1859.

The Monthly General Meeting of the Asiatic Society was held on the 2nd instant.

A. Grote, Esq., President, in the chair.

The proceedings of the last meeting were read and confirmed.

Presentations were received.

1. From Lord Ulick Browne, Under-Secretary to the Government of Bengal, two sets of Photographic Drawings of the ancient buildings at Beejapore, the Ashar Mobarick, and the Mehteree Mehal, transmitted for the Society by the Right Hon'ble the Secretary of State for India.

2. From Baboo Kaliprosunno Singh, groups of Figures in clay on two platforms, by a native artist of Nuddea, the one representing a Bazar the other an Indigo Factory.

3. From the same, a copy of the *Govind lelamrita* by Roop Goswami.

4. From R. Swinhoe, Esq., H. M.'s Consulate, Amoy. A collection of sundries from South China and Formosa : among them is the skull of a Deer, sent as that of the Spotted Deer of Formosa : it is apparently of an undescribed species, akin to the British Red Deer, and totally different from the Spotted Deer of India. Also a skull of the small Chinese Muntjac Deer ; and some fine skins, including one of *Mustoza Sibirica*, and a flat skin of the common Indian Pangolin : and of reptiles, a large *Python molurus* from Formosa and a fine new *Bungarus*, &c.

5. Rev. H. Baker, Junior, of Mundakyum, Alipi, South Malabar. A dozen skins of the new spiny Dormouse *Platacanthomys lasiurus* ; and other skins of field Rats, and of Shrews from that vicinity.

6. Captain Hodge, commanding the guard ship *Sesostris*, at Port Blair. A few bird skins, comprising a fine new Woodpecker ; several reptiles, bringing the number of now ascertained *Reptilia* from the Andamans to 12, of which 5 are Lizards and 7 Snakes, 3



of the latter being venomous ; another fine collection of fishes chiefly in spirit, and some Crustacea and sundries. A snake of the genus *Trigonocephalus* now arrived has fangs of extraordinary length, and, to all appearance it should be one of the most formidable of the tribe.

7. Baboo Ram Sehay Lall, native Doctor attached to the Police Levy, a double headed kitten, forwarded by Adjutant E. Berril of that corps.

8. Baboo Rajendra Mullick, two dead monkeys.

#### READ A LETTER

From Dr. D. T. Morton, Tounghoo, desiring to withdraw from the Society in consequence of his intended departure for Europe.

The following gentlemen duly proposed at the last meeting were balloted for and elected ordinary members.

Major S. R. Tickell, Moulmein (re-elected). J. Sanders, Esq., Presidency College, C. A. Elliot, Esq., C. S.

Dr. Frederick of Batavia was also elected a corresponding member.

The following gentlemen were named for ballot as ordinary members at the next meeting.

The Hon'ble J. P. Grant, Lieut.-Governor of Bengal, proposed by the President and seconded by Dr. Thomson.

Moulvie Futteh Ally proposed by Mr. Atkinson, and seconded by the President.

F. Fisk Williams, Esq., proposed by Major Tytler, seconded by Mr. Atkinson.

F. A. Goodenough, Esq., proposed by G. G. Morris, Esq., and seconded by the President.

H. Leonard, Esq., C. E., proposed by the President and seconded by T. Oldham, Esq.

#### *Report from the Council.*

The Council beg to announce that they have adopted the recommendations of the Philological Committee contained in the following report, and request the Society's approval of the same.

#### REPORT OF PHILOLOGICAL COMMITTEE.

"The Philological Committee recommend to the Council, that a new series of the Bibliotheca Indica should be commenced, it hav-

ing been already resolved, that no new works should be undertaken in the existing series.

“They would also recommend that the translation of the *Surya Siddhanta*, as well as that of the *Surya Siromani*, (the former by Pundit Bapu Deva of Benares,) which Archdeacon Pratt has communicated to the Society, and which he has undertaken to superintend the publication of, be forthwith sent to the press to form the commencement of the new series. The *Surya Siddhanta* has already appeared in the original in our first series, and the translation will be a most valuable addition, as it will make the Sanscrit Astronomy intelligible to the scientific world in general.

“The *Siromani* is a shorter treatise, which serves admirably as an appendix to the larger work.”

The Council in submitting the above report, beg to add that the present state of the Oriental Fund, quite justifies the Society in undertaking this new series. The assets, including Rs. 3,500 Company's Paper, amount to about Rs. 15,300 while the liabilities for editing charges, and unpaid printer's bills, &c., amount to about Rs. 6,000 leaving a balance in favor of the Fund of Rs. 9,300

#### COMMUNICATIONS RECEIVED.

1. From Lieut.-Col. A. P. Phayre, a paper on the History of the Shwe Dagon Pagoda at Rangoon with a sketch of its elevation.

A paper was read entitled an Itinerary in the Tenasserim Provinces, by Major Tickell with Botanical Notes by the Rev. C. S. P. Parish.

These papers will shortly appear in the Journal.

#### LIBRARY.

The following accessions have been made to the Library since the Meeting in October last.

#### *Presentations.*

The Oriental Baptist for November and December, 1859.—BY THE EDITOR.

The Calcutta Christian Observer for ditto ditto.—BY THE EDITORS.

The London, Edinburgh and Dublin Philosophical Magazine, Nos. 119 and 120 for September and October, 1859.

Bibidharta Sangraha for Magh, 1780.—BY THE EDITOR.

Proceedings of the Royal Society, No. 56.—BY THE ROYAL SOCIETY.

Annual Report of Superintendent of the Geological Survey of India for 1858-59.—BY THE SUPERINTENDENT.

Journal Asiatique, Tome XIII. No. 32 for June, 1859.—BY THE ASIATIC SOCIETY OF PARIS.

Pointed and Unpointed Romanic Alphabets compared, by G. G. Thompson.—BY THE AUTHOR.

Memoirs of the Geological Survey of India, Vol. 1st, Part III. 2 copies.—BY THE HOME GOVERNMENT.

Address at the Anniversary Meeting of the Royal Geographical Society.—BY THE SOCIETY.

Journal of the Statistical Society of London for September, 1859.—BY THE SOCIETY.

Madras Journal of Literature and Science for October and March, 1858-59.

Transactions of the Royal Geographical Society from May, 1857 to May, 1858, Vol. XIV.—BY THE SOCIETY.

The Oriental Christian Spectator for October 1859.—BY THE EDITOR.

Geographical Notice of the Royal Illustrated Atlas.—BY DR. NORTON SHAW.

The Athenæum for August and September, 1859.

Selections from the Records of the Bombay Government, No. 51. Memoir of the Ruins of Babylon. By William Beaumont Selby, with plans.—BY THE BOMBAY GOVERNMENT.

*Purchased.*

Revue des Deux Mondes for 15th August, 1st and 15th September and 1st October, 1859, 4 Nos.

Annales des Sciences Naturelles, Tome X. No. 6, Tome XI. Nos. 1 and 2.

The Literary Gazette, Nos. 60 to 68.

Comptes Rendus, Nos. 4 to 11, from 25th July to 12th September, 1859.

Journal des Savants for July, August and September, 1859.

Die Religion des Buddha von Carl Friedrich Kœppen, Zweiter Band.

Revue et Magasin de Zoologie, Nos. 7, 8 and 9.

The Annals and Magazine of Natural History, Nos. 21 and 22.

Die Lieder des Hafis, Zweite Band Drittes Heft.

Conchologia Iconica, Parts 186 and 187.

Numismatique des Arabes avant l' Islamisme, par Victor Langlois.

Philosophie und Theologie, von Averoes, von Marcus Joseph Muller.

Westminster Review for October, 1859.

The Natural History Review for July, 1859.

The American Journal of Science and Arts for September, 1859.

Dr. Max Muller's Origin of the Introduction of Writing in the East.

FOR DECEMBER, 1859.

The Monthly General Meeting of the Asiatic Society was held on the 7th instant.

A. Grote Esq., President, in the chair.

The proceedings of the last meeting were read and confirmed.

Presentations were received—

1. From C. H. Lushington, Esq., Secretary to the Government of India, specimens of rupees recovered from the wreck of the P. and O. Company's Steamer *Ava* by the divers of the H. M. S. *Retribution*, sent by Commodore Edgell.

2. From the Superintendent Geological Survey of India, memoirs of the Geological Survey, vol. I. p. III.

3. From the Bombay Government No. 51 of the Selections from its Records being a memoir of the Ruins of Babylon, by William Beaumont Selby, with plans.

4. E. S. Layard, Esq., in charge of the Museum in Capetown. A valuable collection of skins of mammalia and birds from South Africa comprising 28 species of mammalia and 39 species of birds, of which 21 species of mammalian and 18 species of birds are wholly new to the Society's collections.

5. Babu Rajendra Mullick, several dead birds, comprising one of the desiderata in every zoological museum, a magnificent male specimen of the Golden Pheasant.

6. Captain Hodge, commanding the guard-ship *Sesostris* at Port Blair. A further collection of sundries from the Andaman Islands.

7. Rev. J. Cave-Brown. A collection of reptiles, insects, &c., preserved in spirits from Subhatoo.

The following gentlemen duly proposed at the last meeting, were ballotted for and elected ordinary members.

The Hon'ble J. P. Grant, Lieutenant-Governor of Bengal.

Moulavee Futteh Ally, serishtadar of superintendent of the Mysore Princes' Office.

F. A. Goodenough, Esq., and H. Leonard, Esq., C. E.

The following gentlemen were named for ballot, as ordinary members at the next meeting.

Prince Mahomed Jallaluddin of Mysore, proposed by Mr. Atkinson, and seconded by the President.

T. R. Grant, Esq., proposed by Dr. Boycott, and seconded by Dr. Eatwell.

H. V. Bayley, Esq., proposed (for re-election) by the President, and seconded by Dr. Thomson.

W. J. Rivett Carnac, Esq., proposed by the President, and seconded by Captain W. N. Lees.

Baboo Preonuath Sett, proposed by Babu Rajendra Lall Mittra, and seconded by the President.

Dr. Theodore Duka, proposed by the President, and seconded by Mr. Stainforth.

Major J. J. M. Innes, Bengal Engineers, proposed by Mr. Atkinson, and seconded by Col. Baird Smith.

G. Lindsay, Esq., proposed by Mr. A. Fisher, and seconded by Mr. H. Blanford.

Rev. J. C. Thompson, proposed (for re-election) by Mr. Jones, and seconded by Dr. Boycott.

C. Oldham, Esq., proposed by Mr. T. Oldham, and seconded by the President.

Capt. Alexander Fraser, Bengal Engineers, proposed by Mr. Atkinson, and seconded by Capt. Dickens.

David K. Mair, Esq., proposed by Mr. A. Fisher, and seconded by Dr. Boycott.

#### Read a Letter

From B. H. Hodgson, Esq., conveying to the Society his deep sense of the honor it had conferred on him by electing him an Honorary Member, and assuring the Society of his hearty interest in its welfare.

Communications were received—

1. From R. B. Chapman, Esq., Under-Secy. to the Government of India, forwarding copies of statements of Doodnauth Tewary, and Jhindoo, converts in Port Blair.

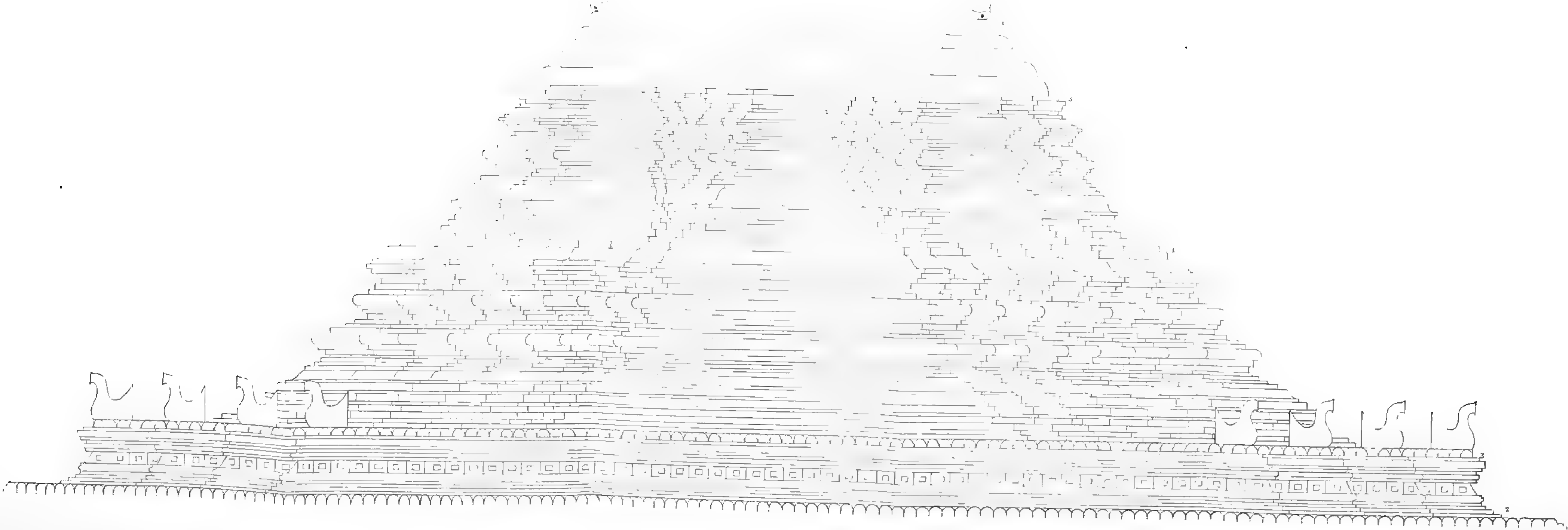
2. From Baboo Radha Nath Sikdar, an abstract of the hourly meteorological observations taken at the Surveyor General's Office in the month of May last.

Colonel Baird Smith exhibited and explained to the Society the series of plans of Delhi, that have been prepared to illustrate the topography of the place, and the late operations against it in 1857.

The thanks of the meeting were voted to Colonel Smith, for his able and interesting explanation of the plans exhibited to the Society.

The Officiating Librarian submitted the usual report.





ELEVATION OF  
THE  
SHWĒ DAGON PAGODA  
AT  
RANGOON.

SCALE 1/1000 = 1/1000  
22





THE SOUTH EAST PORTION OF THE  
DISTRICT OF  
**AMHERST**  
(*Penajirim*)

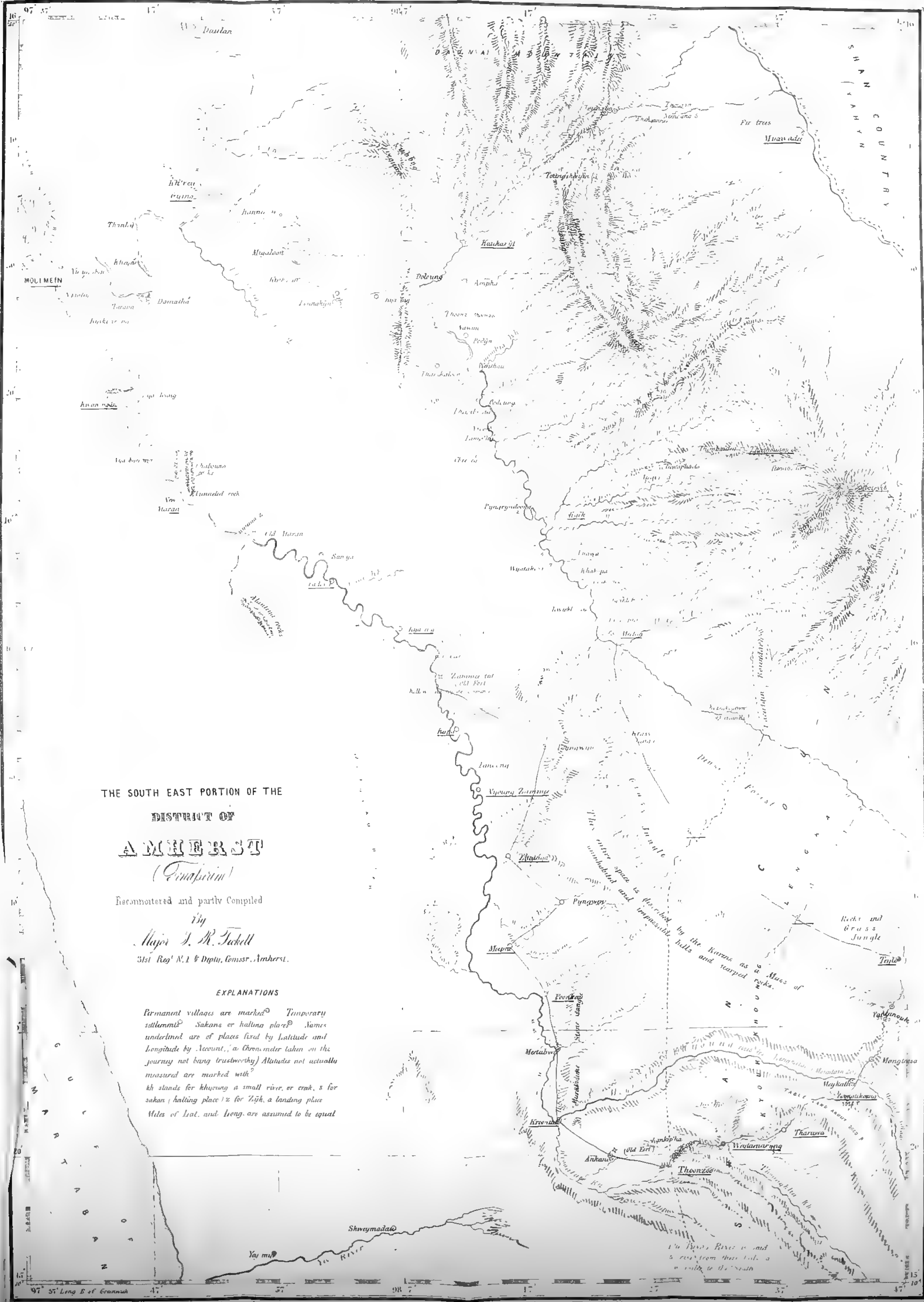
Reconnoitered and partly Compiled

By  
*Major J. R. Tuckell*

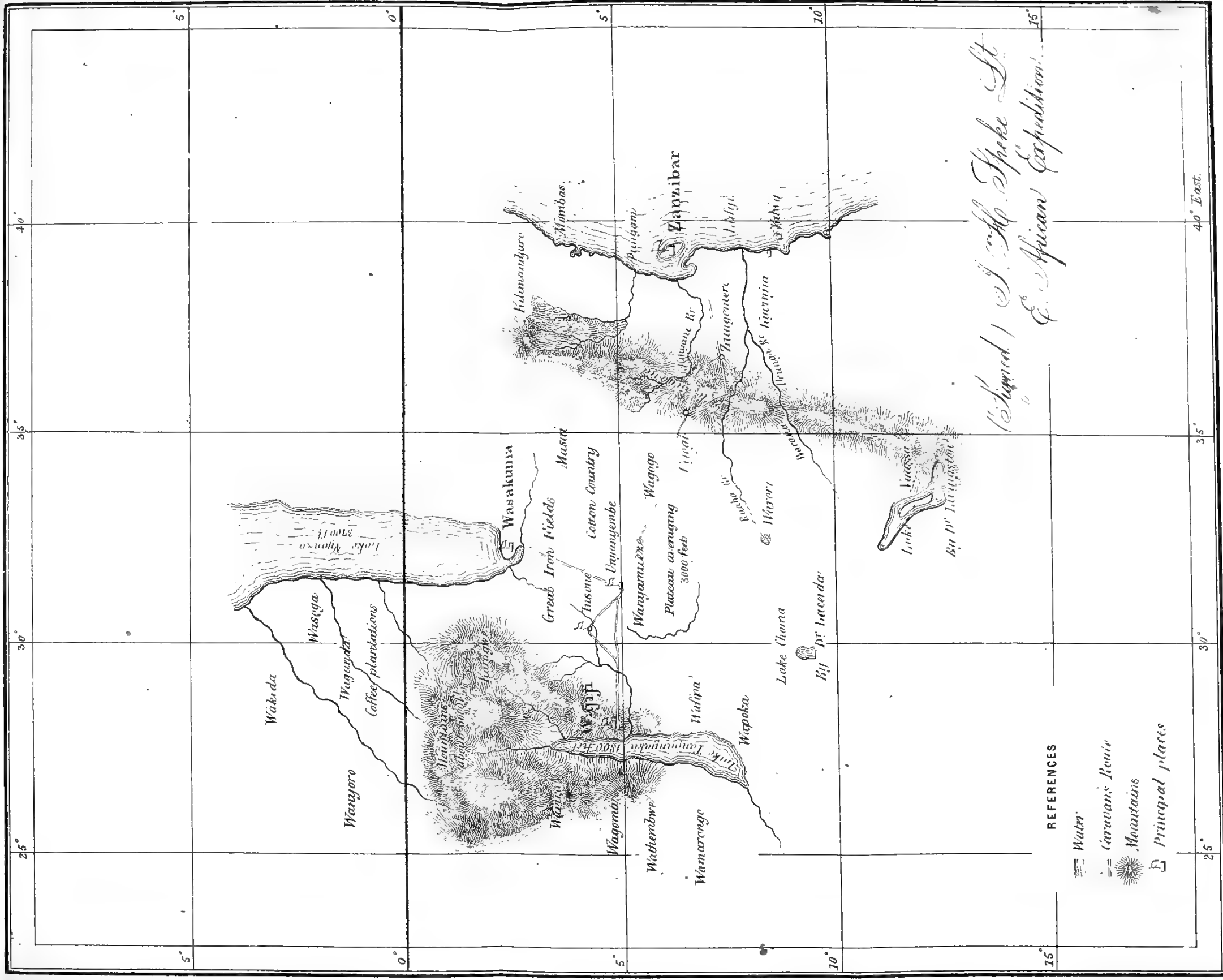
31st Regt N.I. & Dept. Comdr. Amherst.

EXPLANATIONS

Permanent villages are marked. Temporary settlements or halting places. Names underlined are of places fixed by latitude and longitude by Account, or Chronometer taken on the journey not being trustworthy. Altitudes not actually measured are marked with ?  
kh stands for khuyung a small river, or creek, s for sakan (halting place) z for Zikh, a landing place  
Miles of Lat. and Long. are assumed to be equal









# Meteorological Observations.

## Abstract of the Results of the Hourly Meteorological Observations taken at the Surveyor General's Office, Calcutta, in the month of January, 1859.

Latitude 22° 33' 1" North. Longitude 88° 20' 34" East.

Feet.  
Height of the Cistern of the Standard Barometer above the Sea level, 18.11

Daily Means, &c. of the Observations and of the Hygrometrical elements  
dependent thereon.

| Date. | Mean Height of<br>the Barometer<br>at 32° Fahr. | Range of the Barometer<br>during the day. |         |         | Mean Dry Bulb<br>Thermometer. | Range of the Tempera-<br>ture during the day. |      |       |
|-------|-------------------------------------------------|-------------------------------------------|---------|---------|-------------------------------|-----------------------------------------------|------|-------|
|       |                                                 | Max.                                      | Min.    | Diff.   |                               | Max.                                          | Min. | Diff. |
|       | Inches.                                         | Inches.                                   | Inches. | Inches. | °                             | °                                             | °    | °     |
| 1     | 30.032                                          | 30.120                                    | 29.953  | 0.167   | 65.8                          | 74.4                                          | 59.6 | 14.8  |
| 2     | <i>Sunday.</i>                                  |                                           |         |         |                               |                                               |      |       |
| 3     | .057                                            | .128                                      | 30.006  | .122    | 66.5                          | 75.6                                          | 58.6 | 17.0  |
| 4     | .027                                            | .112                                      | 29.958  | .154    | 67.6                          | 77.2                                          | 61.4 | 15.8  |
| 5     | 29.998                                          | .074                                      | .958    | .116    | 69.0                          | 76.4                                          | 62.6 | 13.8  |
| 6     | 30.014                                          | .093                                      | .953    | .140    | 70.1                          | 76.5                                          | 66.4 | 10.1  |
| 7     | .032                                            | .131                                      | .974    | .157    | 69.7                          | 79.6                                          | 61.0 | 18.6  |
| 8     | .062                                            | .138                                      | .994    | .144    | 67.6                          | 75.4                                          | 61.8 | 13.6  |
| 9     | <i>Sunday.</i>                                  |                                           |         |         |                               |                                               |      |       |
| 10    | .054                                            | .138                                      | .992    | .146    | 67.8                          | 77.2                                          | 60.9 | 16.3  |
| 11    | .070                                            | .163                                      | 30.001  | .162    | 68.0                          | 78.1                                          | 59.8 | 18.3  |
| 12    | .065                                            | .160                                      | 29.997  | .163    | 68.4                          | 78.0                                          | 59.9 | 18.1  |
| 13    | .044                                            | .135                                      | .995    | .140    | 68.2                          | 78.6                                          | 60.0 | 18.6  |
| 14    | .029                                            | .100                                      | .979    | .121    | 68.9                          | 79.2                                          | 61.6 | 17.6  |
| 15    | .057                                            | .134                                      | 30.011  | .123    | 69.4                          | 79.8                                          | 61.2 | 18.6  |
| 16    | <i>Sunday.</i>                                  |                                           |         |         |                               |                                               |      |       |
| 17    | .067                                            | .148                                      | .007    | .141    | 69.6                          | 78.6                                          | 63.8 | 14.8  |
| 18    | .018                                            | .096                                      | 29.947  | .149    | 69.4                          | 79.2                                          | 60.8 | 18.4  |
| 19    | 29.938                                          | .025                                      | .885    | .140    | 69.0                          | 79.6                                          | 60.4 | 19.2  |
| 20    | .933                                            | 29.993                                    | .891    | .102    | 71.1                          | 82.8                                          | 62.6 | 20.2  |
| 21    | 30.005                                          | 30.105                                    | .952    | .153    | 69.2                          | 78.2                                          | 62.8 | 15.4  |
| 22    | 29.959                                          | .069                                      | .888    | .181    | 66.0                          | 76.8                                          | 57.0 | 19.8  |
| 23    | <i>Sunday.</i>                                  |                                           |         |         |                               |                                               |      |       |
| 24    | .914                                            | .000                                      | .866    | .134    | 67.5                          | 79.2                                          | 57.6 | 21.6  |
| 25    | .928                                            | .021                                      | .870    | .151    | 68.7                          | 81.2                                          | 58.4 | 22.8  |
| 26    | .906                                            | 29.975                                    | .851    | .124    | 70.5                          | 83.6                                          | 60.2 | 23.4  |
| 27    | .969                                            | 30.037                                    | .925    | .112    | 70.8                          | 82.0                                          | 61.0 | 21.0  |
| 28    | .993                                            | .077                                      | .941    | .136    | 71.0                          | 82.3                                          | 61.0 | 21.3  |
| 29    | .964                                            | .059                                      | .905    | .154    | 71.9                          | 84.4                                          | 62.0 | 22.4  |
| 30    | <i>Sunday.</i>                                  |                                           |         |         |                               |                                               |      |       |
| 31    | .914                                            | 29.976                                    | .859    | .117    | 74.3                          | 85.2                                          | 66.0 | 19.2  |

The Mean height of the Barometer, as likewise the Mean Dry and Wet Bulb Thermometers are derived from the twenty-four hourly observations made during the day.

*Abstract of the Results of the Hourly Meteorological Observations  
taken at the Surveyor General's Office, Calcutta,  
in the month of January, 1859.*

Daily Means, &c. of the Observations and of the Hygrometrical elements  
dependent thereon.—(Continued.)

| Date. | Mean Wet Bulb Ther-<br>mometer. | Dry Bulb above Wet. | Computed Dew Point. | Dew<br>Bulb above Dew<br>Point. | Mean Elastic force of<br>Vapour. | Mean Weight of Vapour<br>in a cubic foot of air. | Additional Weight of Va-<br>pour required for com-<br>plete saturation. | Mean degree of Humi-<br>dity, complete satura-<br>tion being unity. |
|-------|---------------------------------|---------------------|---------------------|---------------------------------|----------------------------------|--------------------------------------------------|-------------------------------------------------------------------------|---------------------------------------------------------------------|
| 1     | 59.3                            | 6.5                 | 55.4                | 10.4                            | Inches.<br>0.449                 | T. gr.<br>4.98                                   | T. gr.<br>2.06                                                          | 0.71                                                                |
| 2     | Sunday.                         |                     |                     |                                 |                                  |                                                  |                                                                         |                                                                     |
| 3     | 61.6                            | 4.9                 | 58.7                | 7.8                             | .501                             | 5.55                                             | 1.64                                                                    | .77                                                                 |
| 4     | 63.4                            | 4.2                 | 60.9                | 6.7                             | .539                             | .96                                              | .48                                                                     | .80                                                                 |
| 5     | 65.1                            | 3.9                 | 63.1                | 5.9                             | .580                             | 6.39                                             | .37                                                                     | .82                                                                 |
| 6     | 66.3                            | 3.8                 | 64.4                | 5.7                             | .605                             | .66                                              | .37                                                                     | .83                                                                 |
| 7     | 64.0                            | 5.7                 | 61.1                | 8.6                             | .543                             | 5.97                                             | .96                                                                     | .75                                                                 |
| 8     | 61.7                            | 5.9                 | 58.2                | 9.4                             | .493                             | .45                                              | .99                                                                     | .73                                                                 |
| 9     | Sunday.                         |                     |                     |                                 |                                  |                                                  |                                                                         |                                                                     |
| 10    | 62.5                            | 5.3                 | 59.3                | 8.5                             | .511                             | .64                                              | .84                                                                     | .75                                                                 |
| 11    | 62.8                            | 5.2                 | 59.7                | 8.3                             | .518                             | .73                                              | .80                                                                     | .76                                                                 |
| 12    | 62.9                            | 5.5                 | 59.6                | 8.8                             | .516                             | .70                                              | .92                                                                     | .75                                                                 |
| 13    | 63.1                            | 5.1                 | 60.0                | 8.2                             | .523                             | .78                                              | .80                                                                     | .76                                                                 |
| 14    | 64.0                            | 4.9                 | 61.5                | 7.4                             | .550                             | 6.07                                             | .67                                                                     | .78                                                                 |
| 15    | 64.1                            | 5.3                 | 61.4                | 8.0                             | .548                             | .04                                              | .82                                                                     | .77                                                                 |
| 16    | Sunday.                         |                     |                     |                                 |                                  |                                                  |                                                                         |                                                                     |
| 17    | 63.9                            | 5.7                 | 61.0                | 8.6                             | .541                             | 5.95                                             | .95                                                                     | .75                                                                 |
| 18    | 62.9                            | 6.5                 | 59.6                | 9.8                             | .516                             | .68                                              | 2.18                                                                    | .72                                                                 |
| 19    | 62.9                            | 6.1                 | 59.8                | 9.2                             | .520                             | .73                                              | .03                                                                     | .74                                                                 |
| 20    | 64.9                            | 6.2                 | 61.8                | 9.3                             | .555                             | 6.10                                             | .18                                                                     | .74                                                                 |
| 21    | 62.2                            | 7.0                 | 58.7                | 10.5                            | .501                             | 5.52                                             | .29                                                                     | .71                                                                 |
| 22    | 58.2                            | 7.8                 | 53.5                | 12.5                            | .421                             | 4.67                                             | .41                                                                     | .66                                                                 |
| 23    | Sunday.                         |                     |                     |                                 |                                  |                                                  |                                                                         |                                                                     |
| 24    | 60.8                            | 6.7                 | 56.8                | 10.7                            | .470                             | 5.19                                             | .23                                                                     | .70                                                                 |
| 25    | 62.5                            | 6.2                 | 59.4                | 9.3                             | .513                             | .66                                              | .03                                                                     | .74                                                                 |
| 26    | 63.6                            | 6.9                 | 60.1                | 10.4                            | .525                             | .77                                              | .36                                                                     | .71                                                                 |
| 27    | 64.0                            | 6.8                 | 60.6                | 10.2                            | .534                             | .86                                              | .34                                                                     | .72                                                                 |
| 28    | 64.6                            | 6.4                 | 61.4                | 9.6                             | .548                             | 6.02                                             | .23                                                                     | .73                                                                 |
| 29    | 65.5                            | 6.4                 | 62.3                | 9.6                             | .565                             | .18                                              | .30                                                                     | .73                                                                 |
| 30    | Sunday.                         |                     |                     |                                 |                                  |                                                  |                                                                         |                                                                     |
| 31    | 68.0                            | 6.3                 | 64.8                | 9.5                             | .613                             | .69                                              | .43                                                                     | .73                                                                 |

All the Hygrometrical elements are computed by the Greenwich Constants.

*Abstract of the Results of the Hourly Meteorological Observations  
taken at the Surveyor General's Office, Calcutta,  
in the month of January, 1859.*

Hourly Means, &c. of the Observations and of the Hygrometrical elements  
dependent thereon.

| Hour.          | Mean Height of<br>the Barometer<br>at 32° Fahr. | Range of the Barometer<br>for each hour during<br>the month. |         |         | Mean Dry Bulb<br>Thermometer. | Range of the Temperature<br>for each hour during<br>the month. |      |       |
|----------------|-------------------------------------------------|--------------------------------------------------------------|---------|---------|-------------------------------|----------------------------------------------------------------|------|-------|
|                |                                                 | Max.                                                         | Min.    | Diff.   |                               | Max.                                                           | Min. | Diff. |
|                | Inches.                                         | Inches.                                                      | Inches. | Inches. | o                             | o                                                              | o    | o     |
| Mid-<br>night. | 30.002                                          | 30.093                                                       | 29.907  | 0.186   | 65.0                          | 70.0                                                           | 60.8 | 9.2   |
| 1              | 29.996                                          | .089                                                         | .894    | .195    | 64.2                          | 69.6                                                           | 60.2 | 9.4   |
| 2              | .988                                            | .078                                                         | .885    | .193    | 63.5                          | 69.0                                                           | 59.7 | 9.3   |
| 3              | .982                                            | .065                                                         | .878    | .187    | 62.9                          | 68.9                                                           | 59.6 | 9.3   |
| 4              | .977                                            | .060                                                         | .871    | .189    | 62.4                          | 68.2                                                           | 58.8 | 9.4   |
| 5              | .988                                            | .070                                                         | .879    | .191    | 62.0                          | 67.0                                                           | 58.3 | 8.7   |
| 6              | 30.003                                          | .084                                                         | .896    | .188    | 61.5                          | 67.0                                                           | 57.0 | 10.0  |
| 7              | .027                                            | .101                                                         | .922    | .179    | 61.1                          | 66.0                                                           | 57.0 | 9.0   |
| 8              | .060                                            | .143                                                         | .951    | .192    | 64.6                          | 68.6                                                           | 60.7 | 7.9   |
| 9              | .079                                            | .154                                                         | .965    | .189    | 67.9                          | 71.6                                                           | 64.2 | 7.4   |
| 10             | .084                                            | .163                                                         | .975    | .188    | 70.8                          | 74.6                                                           | 67.0 | 7.6   |
| 11             | .063                                            | .141                                                         | .959    | .182    | 73.7                          | 77.4                                                           | 69.0 | 8.4   |
|                |                                                 |                                                              |         |         |                               |                                                                |      |       |
| Noon.          | .031                                            | .107                                                         | .921    | .186    | 76.2                          | 81.0                                                           | 71.6 | 9.4   |
| 1              | 29.999                                          | .082                                                         | .896    | .186    | 78.0                          | 83.4                                                           | 74.0 | 9.4   |
| 2              | .972                                            | .047                                                         | .864    | .183    | 78.9                          | 85.0                                                           | 74.2 | 10.8  |
| 3              | .954                                            | .031                                                         | .852    | .179    | 79.1                          | 85.2                                                           | 74.4 | 10.8  |
| 4              | .948                                            | .030                                                         | .851    | .179    | 77.1                          | 83.7                                                           | 71.5 | 12.2  |
| 5              | .953                                            | .037                                                         | .853    | .184    | 75.3                          | 82.2                                                           | 70.1 | 12.1  |
| 6              | .961                                            | .043                                                         | .868    | .175    | 72.9                          | 78.8                                                           | 67.4 | 11.4  |
| 7              | .977                                            | .062                                                         | .892    | .170    | 70.6                          | 76.2                                                           | 65.8 | 10.4  |
| 8              | .991                                            | .075                                                         | .908    | .167    | 69.0                          | 74.8                                                           | 64.6 | 10.2  |
| 9              | 30.002                                          | .087                                                         | .922    | .165    | 67.8                          | 73.2                                                           | 63.0 | 10.2  |
| 10             | .006                                            | .127                                                         | .920    | .207    | 66.8                          | 72.6                                                           | 62.0 | 10.6  |
| 11             | .000                                            | .092                                                         | .922    | .170    | 65.9                          | 72.0                                                           | 61.2 | 10.8  |

The Mean Height of the Barometer, as likewise the Mean Dry and Wet Bulb Thermometers are derived from the observations made at the several hours during the month.

*Abstract of the Results of the Hourly Meteorological Observations  
taken at the Surveyor General's Office, Calcutta,  
in the month of January, 1859.*

Hourly Means, &c. of the Observations and of the Hygrometrical elements  
dependent thereon.—(Continued.)

| Hour.          | Mean Wet Bulb<br>Thermometer. | Dry Bulb above Wet. | Computed Dew point. | Dry Bulb above Dew<br>point. | Mean elastic force of<br>Vapour. | Mean Weight of Va-<br>pour in a Cubic foot<br>of Air. | Additional weight of<br>vapour required for<br>complete saturation. | Mean degree of hu-<br>midity, complete satu-<br>ration being unity. |
|----------------|-------------------------------|---------------------|---------------------|------------------------------|----------------------------------|-------------------------------------------------------|---------------------------------------------------------------------|---------------------------------------------------------------------|
|                | o                             | o                   | o                   | o                            | Inches.                          | Troy grs.                                             | Troy grs.                                                           |                                                                     |
| Mid-<br>night. | 61.7                          | 3.3                 | 59.7                | 5.3                          | 0.518                            | 5.76                                                  | 1.11                                                                | 0.84                                                                |
| 1              | 61.2                          | 3.0                 | 59.1                | 5.1                          | .508                             | .65                                                   | .04                                                                 | .85                                                                 |
| 2              | 60.6                          | 2.9                 | 58.6                | 4.9                          | .499                             | .56                                                   | 0.99                                                                | .85                                                                 |
| 3              | 60.0                          | 2.9                 | 58.0                | 4.9                          | .489                             | .45                                                   | .98                                                                 | .85                                                                 |
| 4              | 59.7                          | 2.7                 | 57.8                | 4.6                          | .486                             | .43                                                   | .90                                                                 | .86                                                                 |
| 5              | 59.3                          | 2.7                 | 57.4                | 4.6                          | .480                             | .36                                                   | .89                                                                 | .86                                                                 |
| 6              | 59.0                          | 2.5                 | 57.2                | 4.3                          | .476                             | .33                                                   | .83                                                                 | .87                                                                 |
| 7              | 58.7                          | 2.4                 | 56.8                | 4.3                          | .470                             | .27                                                   | .81                                                                 | .87                                                                 |
| 8              | 61.2                          | 3.4                 | 59.2                | 5.4                          | .509                             | .67                                                   | 1.11                                                                | .84                                                                 |
| 9              | 62.8                          | 5.1                 | 59.7                | 8.2                          | .518                             | .73                                                   | .78                                                                 | .76                                                                 |
| 10             | 64.0                          | 6.8                 | 60.6                | 10.2                         | .534                             | .86                                                   | 2.34                                                                | .72                                                                 |
| 11             | 65.3                          | 8.4                 | 61.1                | 12.6                         | .543                             | .92                                                   | 3.04                                                                | .66                                                                 |
| Noon.          | 66.2                          | 10.0                | 61.2                | 15.0                         | .544                             | .92                                                   | .74                                                                 | .61                                                                 |
| 1              | 66.7                          | 11.3                | 61.0                | 17.0                         | .541                             | .85                                                   | 4.34                                                                | .57                                                                 |
| 2              | 67.1                          | 11.8                | 61.2                | 17.7                         | .544                             | .88                                                   | .59                                                                 | .56                                                                 |
| 3              | 67.1                          | 12.0                | 61.1                | 18.0                         | .543                             | .86                                                   | .67                                                                 | .56                                                                 |
| 4              | 66.1                          | 11.0                | 60.6                | 16.5                         | .534                             | .78                                                   | .14                                                                 | .58                                                                 |
| 5              | 66.2                          | 9.1                 | 61.6                | 13.7                         | .552                             | 6.00                                                  | 3.40                                                                | .64                                                                 |
| 6              | 66.3                          | 6.6                 | 63.0                | 9.9                          | .578                             | .32                                                   | 2.41                                                                | .72                                                                 |
| 7              | 65.4                          | 5.2                 | 62.8                | 7.8                          | .574                             | .31                                                   | 1.84                                                                | .77                                                                 |
| 8              | 64.5                          | 4.5                 | 62.2                | 6.8                          | .563                             | .20                                                   | .56                                                                 | .80                                                                 |
| 9              | 63.7                          | 4.1                 | 61.2                | 6.6                          | .544                             | .01                                                   | .47                                                                 | .80                                                                 |
| 10             | 63.0                          | 3.8                 | 60.7                | 6.1                          | .536                             | 5.93                                                  | .33                                                                 | .82                                                                 |
| 11             | 62.4                          | 3.5                 | 60.3                | 5.6                          | .528                             | .86                                                   | .20                                                                 | .83                                                                 |

All the Hygrometrical elements are computed by the Greenwich Constants.



*Abstract of the Results of the Hourly Meteorological Observations  
taken at the Surveyor General's Office, Calcutta,  
in the month of January, 1859.*

Solar Radiation, Weather, &c.

| Date. | Max. Solar radiation. | Rain Gauge 5 feet above Ground. | Prevailing direction of the Wind. | General Aspect of the Sky.                                                                     |
|-------|-----------------------|---------------------------------|-----------------------------------|------------------------------------------------------------------------------------------------|
|       | o                     | Inches.                         |                                   |                                                                                                |
| 1     | 134.0                 | ..                              | N. W. & N.                        | Cloudless.                                                                                     |
| 2     | <i>Sunday.</i>        |                                 |                                   |                                                                                                |
| 3     | 131.0                 | ..                              | N.                                | Cloudless till 6 A. M. Scatd. $\searrow$ i and $\swarrow$ i till 4 P. M. cloudless afterwards. |
| 4     | 125.7                 | ..                              | N. & N. W. & E.                   | Cloudless till 5 A. M. Scatd. $\swarrow$ i till 6 P. M. cloudless afterwards.                  |
| 5     | ..                    | ..                              | N. W. & N. & W.                   | Cloudless till 5 A. M. Scatd. clouds afterwards.                                               |
| 6     | ...                   | ..                              | N. & W.                           | Cloudy till 6 P. M. cloudless afterwards.                                                      |
| 7     | 137.8                 | ..                              | N. & N. W.                        | Cloudless.                                                                                     |
| 8     | 134.2                 | ..                              | W. & N.                           | Cloudless.                                                                                     |
| 9     | <i>Sunday.</i>        |                                 |                                   |                                                                                                |
| 10    | 133.7                 | ..                              | N.                                | Cloudless.                                                                                     |
| 11    | 135.2                 | ..                              | N. & S.                           | Cloudless.                                                                                     |
| 12    | 136.0                 | ..                              | S. W. & S.                        | Cloudless.                                                                                     |
| 13    | 133.6                 | ..                              | N. W. & N.                        | Cloudless.                                                                                     |
| 14    | 135.0                 | ..                              | N. W. & N. & W.                   | Cloudless.                                                                                     |
| 15    | 136.0                 | ..                              | W. & N. W.                        | Cloudless.                                                                                     |
| 16    | <i>Sunday.</i>        |                                 |                                   |                                                                                                |
| 17    | 133.0                 | ..                              | N. W. & W. & N.                   | Scatd. $\swarrow$ i till 11 A. M. cloudless afterwards.                                        |
| 18    | 138.0                 | ..                              | W. & N.                           | Cloudless.                                                                                     |
| 19    | 138.0                 | ..                              | N. W. & N.                        | Cloudless.                                                                                     |
| 20    | 140.0                 | ..                              | S. W. & E.                        | Cloudless.                                                                                     |
| 21    | 132.0                 | ..                              | N. W. & W.                        | Cloudless.                                                                                     |
| 22    | 138.2                 | ..                              | N. W. & W. & N.                   | Cloudless.                                                                                     |
| 23    | <i>Sunday.</i>        |                                 |                                   |                                                                                                |
| 24    | 141.0                 | ..                              | W. & N.                           | Cloudless till 3 P. M. Scatd. $\searrow$ i and $\swarrow$ i till 8 P. M. cloudless afterwards. |
| 25    | 138.0                 | ..                              | W. & S. W.                        | Cloudless.                                                                                     |
| 26    | 140.0                 | ..                              | S. W. & N. W.                     | Cloudless.                                                                                     |
| 27    | 138.5                 | ..                              | N. & S. W.                        | Cloudless.                                                                                     |
| 28    | 137.0                 | ..                              | W.                                | Cloudless.                                                                                     |
| 29    | 143.0                 | ..                              | W. & E.                           | Cloudless.                                                                                     |
| 30    | <i>Sunday.</i>        |                                 |                                   |                                                                                                |
| 31    | 138.0                 | ..                              | W. & S.                           | Cloudless.                                                                                     |

$\searrow$ i Cirri,  $\swarrow$ i cirro strati,  $\curvearrowright$ i cumuli,  $\curvearrowright$ i cumulo strati,  $\searrow$ -i nimbi,  $\swarrow$ -i strati,  $\searrow$ i cirro cumuli.

*Abstract of the Results of the Hourly Meteorological Observations  
taken at the Surveyor General's Office, Calcutta,  
in the month of January, 1859.*

## MONTHLY RESULTS.

|                                                                 |    |    | Inches. |
|-----------------------------------------------------------------|----|----|---------|
| Mean height of the Barometer for the month,                     | .. | .. | 30.002  |
| Max. height of the Barometer, occurred at 10 A. M. on the 11th, | .. | .. | 30.163  |
| Min. height of the Barometer, occurred at 4 P. M. on the 26th,  | .. | .. | 29.851  |
| <i>Extreme Range</i> of the Barometer during the month,         | .. | .. | 0.312   |
| Mean of the Daily Max. Pressures,                               | .. | .. | 30.085  |
| Ditto ditto Min. ditto,                                         | .. | .. | 29.945  |
| <i>Mean Daily range</i> of the Barometer during the month,      | .. | .. | 0.140   |

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|                                                                 |    |    | °    |
|-----------------------------------------------------------------|----|----|------|
| Mean Dry Bulb Thermometer for the month,                        | .. | .. | 69.1 |
| Max. Temperature, occurred at 3 P. M. on the 31st,              | .. | .. | 85.2 |
| Min. Temperature, occurred at 6 and 7 A. M. on the 22nd,        | .. | .. | 57.0 |
| <i>Extreme Range</i> of the Temperature during the month,       | .. | .. | 28.2 |
| Mean of the Daily Max. Temperature,                             | .. | .. | 79.2 |
| Ditto ditto Min. ditto,                                         | .. | .. | 61.1 |
| <i>Mean Daily range</i> of the Temperature during the month, .. | .. | .. | 18.1 |

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|                                                            |    |    | °                |
|------------------------------------------------------------|----|----|------------------|
| Mean Wet Bulb Thermometer for the month,                   | .. | .. | 63.3             |
| Mean Dry Bulb Thermometer above Mean Wet Bulb Thermometer, | .. | .. | 5.8              |
| Computed Mean Dew Point for the month,                     | .. | .. | 60.4             |
| Mean Dry Bulb Thermometer above computed Mean Dew Point,   | .. | .. | 8.7              |
| Mean Elastic force of vapour for the month, ..             | .. | .. | Inches.<br>0.530 |

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|                                                                         |    |    | Troy grains. |
|-------------------------------------------------------------------------|----|----|--------------|
| Mean weight of vapour for the month,                                    | .. | .. | 5.84         |
| Additional weight of vapour required for complete saturation,           | .. | .. | 1.94         |
| Mean degree of Humidity for the month, complete saturation being unity, | .. | .. | 0.75         |

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|                                                   |    |    | Inches.         |
|---------------------------------------------------|----|----|-----------------|
| Rained No day. Max. fall of rain during 24 hours, | .. | .. | Nil.            |
| Total amount of rain during the month,            | .. | .. | Nil.            |
| Prevailing direction of the Wind, ..              | .. | .. | W. & N. & N. W. |

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in the month of January, 1859.*

MONTHLY RESULTS.

Table showing the number of days on which at a given hour any particular wind  
blew, together with the number of days on which at the same hour,  
when any particular wind was blowing, it rained.

| Hour.     | N.           | Rain on.<br>N. E. | Rain on.<br>E. | Rain on.<br>S. E. | Rain on.<br>S. | Rain on.<br>S. W. | Rain on.<br>W. | Rain on.<br>N. W. | Rain on.<br>Calm. | Rain on. | Missed. |
|-----------|--------------|-------------------|----------------|-------------------|----------------|-------------------|----------------|-------------------|-------------------|----------|---------|
|           | No. of days. |                   |                |                   |                |                   |                |                   |                   |          |         |
| Midnight. | 9            |                   |                |                   |                | 3                 | 3              | 5                 |                   | 6        |         |
| 1         | 9            |                   |                |                   |                | 3                 | 3              | 5                 |                   | 6        |         |
| 2         | 9            |                   |                |                   |                | 2                 | 3              | 6                 |                   | 6        |         |
| 3         | 8            |                   |                |                   |                | 2                 | 3              | 6                 |                   | 6        | 1       |
| 4         | 9            |                   |                |                   |                | 2                 | 2              | 5                 |                   | 8        |         |
| 5         | 9            |                   |                |                   |                | 2                 | 2              | 5                 |                   | 7        | 1       |
| 6         | 10           |                   |                |                   | 1              | 2                 | 2              | 7                 |                   | 4        |         |
| 7         | 8            | 1                 | 1              |                   | 2              | 2                 | 6              | 6                 |                   | 6        |         |
| 8         | 8            | 4                 |                | 1                 |                | 5                 | 2              | 5                 |                   | 5        | 1       |
| 9         | 10           | 3                 | 1              |                   |                | 5                 | 3              | 4                 |                   |          |         |
| 10        | 9            | 2                 | 2              | 1                 | 1              | 1                 | 5              | 5                 |                   | 5        |         |
| 11        | 8            | 2                 | 2              | 1                 | 5              | 1                 | 4              | 3                 |                   | 3        |         |
| Noon.     | 6            | 1                 | 1              | 1                 |                | 5                 | 9              | 3                 |                   |          |         |
| 1         | 2            | 1                 | 1              |                   |                | 5                 | 13             | 4                 |                   |          |         |
| 2         | 3            |                   | 1              | 1                 | 1              | 6                 | 6              | 8                 |                   |          |         |
| 3         | 3            |                   | 1              |                   | 1              | 4                 | 10             | 7                 |                   |          |         |
| 4         | 3            |                   |                |                   |                | 1                 | 15             | 6                 |                   |          |         |
| 5         | 4            | 1                 |                |                   |                | 5                 | 12             | 4                 |                   |          |         |
| 6         | 7            | 1                 | 1              |                   | 1              | 3                 | 7              | 6                 |                   |          |         |
| 7         | 7            | 1                 | 1              |                   | 1              | 3                 | 8              | 5                 |                   |          |         |
| 8         | 7            |                   | 2              |                   | 1              | 2                 | 9              | 5                 |                   |          |         |
| 9         | 6            |                   | 2              |                   | 1              | 2                 | 9              | 6                 |                   |          |         |
| 10        | 7            |                   | 2              |                   | 1              | 2                 | 8              | 6                 |                   |          |         |
| 11        | 7            |                   | 2              |                   | 1              | 2                 | 7              | 6                 |                   |          | 1       |



*Abstract of the Results of the Hourly Meteorological Observations  
taken at the Surveyor General's Office, Calcutta,  
in the month of February, 1859.*

Latitude 22° 33' 1" North. Longitude 88° 20' 34" East.

feet.

Height of the Cistern of the Standard Barometer above the Sea level, 18.11

Daily Means, &c. of the Observations and of the Hygrometrical elements  
dependent thereon.

| Date. | Mean Height of<br>the Barometer<br>at 32° Fahr. | Range of the Barometer<br>during the day. |         |         | Mean Dry Bulb<br>Thermometer. | Range of the Tempera-<br>ture during the day. |      |       |
|-------|-------------------------------------------------|-------------------------------------------|---------|---------|-------------------------------|-----------------------------------------------|------|-------|
|       |                                                 | Max.                                      | Min.    | Diff.   |                               | Max.                                          | Min. | Diff. |
|       | Inches.                                         | Inches.                                   | Inches. | Inches. | o                             | o                                             | o    | o     |
| 1     | 29.966                                          | 30.056                                    | 29.909  | 0.147   | 73.9                          | 83.6                                          | 65.6 | 18.0  |
| 2     | .974                                            | .051                                      | .932    | .119    | 73.8                          | 85.6                                          | 63.8 | 21.8  |
| 3     | .955                                            | .048                                      | .884    | .164    | 75.1                          | 86.3                                          | 67.4 | 18.9  |
| 4     | .980                                            | .074                                      | .931    | .143    | 73.1                          | 82.4                                          | 65.2 | 17.2  |
| 5     | 30.013                                          | .106                                      | .959    | .147    | 71.7                          | 82.8                                          | 63.0 | 19.8  |
| 6     | <i>Sunday.</i>                                  |                                           |         |         |                               |                                               |      |       |
| 7     | .054                                            | .134                                      | 30.013  | .121    | 73.8                          | 83.2                                          | 66.6 | 16.6  |
| 8     | .015                                            | .104                                      | 29.950  | .154    | 74.4                          | 85.2                                          | 68.5 | 16.7  |
| 9     | 29.989                                          | .074                                      | .923    | .151    | 73.6                          | 84.0                                          | 65.5 | 18.5  |
| 10    | .978                                            | .066                                      | .910    | .156    | 75.8                          | 84.0                                          | 69.0 | 15.0  |
| 11    | 30.033                                          | .098                                      | .978    | .120    | 75.1                          | 85.6                                          | 65.8 | 19.8  |
| 12    | .058                                            | .129                                      | .996    | .133    | 76.2                          | 86.8                                          | 66.6 | 20.2  |
| 13    | <i>Sunday.</i>                                  |                                           |         |         |                               |                                               |      |       |
| 14    | .020                                            | .108                                      | .957    | .151    | 73.3                          | 81.8                                          | 66.6 | 15.2  |
| 15    | .049                                            | .146                                      | .993    | .153    | 70.9                          | 81.0                                          | 62.0 | 19.0  |
| 16    | .038                                            | .141                                      | .961    | .180    | 70.0                          | 80.6                                          | 61.0 | 19.6  |
| 17    | 29.975                                          | .062                                      | .900    | .162    | 71.1                          | 81.4                                          | 61.0 | 20.4  |
| 18    | .948                                            | .024                                      | .908    | .116    | 73.1                          | 83.0                                          | 64.0 | 19.0  |
| 19    | .961                                            | .050                                      | .900    | .150    | 76.1                          | 85.8                                          | 68.2 | 17.6  |
| 20    | <i>Sunday.</i>                                  |                                           |         |         |                               |                                               |      |       |
| 21    | .907                                            | 29.990                                    | .838    | .152    | 78.6                          | 89.4                                          | 70.2 | 19.2  |
| 22    | .895                                            | .963                                      | .839    | .124    | 79.8                          | 89.6                                          | 74.0 | 15.6  |
| 23    | .960                                            | 30.080                                    | .891    | .189    | 78.0                          | 86.8                                          | 72.2 | 14.6  |
| 24    | .968                                            | .030                                      | .878    | .152    | 77.7                          | 89.2                                          | 70.0 | 19.2  |
| 25    | .970                                            | .049                                      | .885    | .164    | 73.9                          | 83.0                                          | 68.0 | 15.0  |
| 26    | .931                                            | .020                                      | .855    | .165    | 73.8                          | 82.4                                          | 65.8 | 16.6  |
| 27    | <i>Sunday.</i>                                  |                                           |         |         |                               |                                               |      |       |
| 28    | .900                                            | 29.977                                    | .823    | .154    | 76.6                          | 86.0                                          | 68.2 | 17.8  |

The Mean height of the Barometer, as likewise the Mean Dry and Wet Bulb Thermometers, are derived from the twenty-four hourly observations made during the day.

*Abstract of the Results of the Hourly Meteorological Observations  
taken at the Surveyor General's Office, Calcutta,  
in the month of February, 1859.*

Daily Means, &c. of the Observations and of the Hygrometrical elements  
dependent thereon.—(Continued.)

| Date. | Mean Wet Bulb Thermo-<br>meter. | Dry Bulb above Wet. | Computed Dew Point. | Dry Bulb above Dew<br>Point. | Mean Elastic force of<br>Vapour. | Mean Weight of Vapour<br>in a cubic foot of Air. | Additional Weight of Va-<br>pour required for com-<br>plete saturation. | Mean degree of Humidity,<br>complete saturation be-<br>ing unity. |
|-------|---------------------------------|---------------------|---------------------|------------------------------|----------------------------------|--------------------------------------------------|-------------------------------------------------------------------------|-------------------------------------------------------------------|
|       | o.                              | o                   | o                   | o                            | Inches.                          | T. gr.                                           | T. gr.                                                                  |                                                                   |
| 1     | 66.1                            | 7.8                 | 62.2                | 11.7                         | .0563                            | 6.14                                             | 2.87                                                                    | .068                                                              |
| 2     | 66.8                            | 7.0                 | 63.3                | 10.5                         | .584                             | .37                                              | .61                                                                     | .71                                                               |
| 3     | 68.4                            | 6.7                 | 65.0                | 10.1                         | .617                             | .73                                              | .61                                                                     | .72                                                               |
| 4     | 64.9                            | 8.2                 | 60.8                | 12.3                         | .537                             | 5.88                                             | .91                                                                     | .67                                                               |
| 5     | 62.7                            | 9.0                 | 58.2                | 13.5                         | .493                             | .39                                              | 3.04                                                                    | .64                                                               |
| 6     | <i>Sunday.</i>                  |                     |                     |                              |                                  |                                                  |                                                                         |                                                                   |
| 7     | 69.5                            | 4.3                 | 67.3                | 6.5                          | .666                             | 7.27                                             | 1.71                                                                    | .81                                                               |
| 8     | 68.7                            | 5.7                 | 65.8                | 8.6                          | .634                             | 6.91                                             | 2.24                                                                    | .76                                                               |
| 9     | 68.5                            | 5.1                 | 65.9                | 7.7                          | .636                             | .95                                              | 1.98                                                                    | .78                                                               |
| 10    | 70.5                            | 5.3                 | 67.8                | 8.0                          | .677                             | 7.36                                             | 2.18                                                                    | .77                                                               |
| 11    | 67.4                            | 7.7                 | 63.5                | 11.6                         | .588                             | 6.39                                             | .95                                                                     | .68                                                               |
| 12    | 68.5                            | 7.7                 | 64.6                | 11.6                         | .609                             | .62                                              | 3.04                                                                    | .69                                                               |
| 13    | <i>Sunday.</i>                  |                     |                     |                              |                                  |                                                  |                                                                         |                                                                   |
| 14    | 66.6                            | 6.7                 | 63.2                | 10.1                         | .582                             | .36                                              | 2.48                                                                    | .72                                                               |
| 15    | 62.5                            | 8.4                 | 58.3                | 12.6                         | .494                             | 5.42                                             | .81                                                                     | .66                                                               |
| 16    | 61.9                            | 8.1                 | 57.8                | 12.2                         | .486                             | .35                                              | .65                                                                     | .67                                                               |
| 17    | 63.6                            | 7.5                 | 59.8                | 11.3                         | .520                             | .70                                              | .58                                                                     | .69                                                               |
| 18    | 66.7                            | 6.4                 | 63.5                | 9.6                          | .588                             | 6.42                                             | .37                                                                     | .73                                                               |
| 19    | 70.0                            | 6.1                 | 66.9                | 9.2                          | .657                             | 7.15                                             | .48                                                                     | .74                                                               |
| 20    | <i>Sunday.</i>                  |                     |                     |                              |                                  |                                                  |                                                                         |                                                                   |
| 21    | 71.7                            | 6.9                 | 68.2                | 10.4                         | .686                             | .43                                              | .95                                                                     | .72                                                               |
| 22    | 73.6                            | 6.2                 | 70.5                | 9.3                          | .739                             | .98                                              | .77                                                                     | .74                                                               |
| 23    | 70.3                            | 7.7                 | 66.4                | 11.4                         | .646                             | .00                                              | 3.19                                                                    | .69                                                               |
| 24    | 70.3                            | 7.4                 | 66.6                | 11.1                         | .651                             | .05                                              | .05                                                                     | .70                                                               |
| 25    | 67.3                            | 6.6                 | 64.0                | 9.9                          | .597                             | 6.52                                             | 2.49                                                                    | .72                                                               |
| 26    | 65.5                            | 8.3                 | 61.3                | 12.5                         | .546                             | 5.96                                             | 3.02                                                                    | .66                                                               |
| 27    | <i>Sunday.</i>                  |                     |                     |                              |                                  |                                                  |                                                                         |                                                                   |
| 28    | 70.1                            | 6.5                 | 66.8                | 9.8                          | .655                             | 7.11                                             | 2.66                                                                    | .73                                                               |

All the Hygrometrical elements are computed by the Greenwich constants.

*Abstract of the Results of the Hourly Meteorological Observations  
taken at the Surveyor General's Office, Calcutta,  
in the month of February, 1859.*

Hourly Means, &c. of the Observations and of the Hygrometrical elements  
dependent thereon.

| Hour.          | Mean Height of<br>the Barometer<br>at 32° Fahrt. | Range of the Barometer for<br>each hour during the<br>month. |         |         | Mean Dry Bulb<br>Thermometer. | Range of the Tempera-<br>ture for each hour<br>during the<br>month. |      |       |
|----------------|--------------------------------------------------|--------------------------------------------------------------|---------|---------|-------------------------------|---------------------------------------------------------------------|------|-------|
|                |                                                  | Max.                                                         | Min.    | Diff.   |                               | Max.                                                                | Min. | Diff. |
|                | Inches.                                          | Inches.                                                      | Inches. | Inches. | o                             | o                                                                   | o    | o     |
| Mid-<br>night. | 29.984                                           | 30.050                                                       | 29.898  | 0.152   | 70.2                          | 75.2                                                                | 64.8 | 10.4  |
| 1              | .975                                             | .051                                                         | .891    | .160    | 69.6                          | 75.0                                                                | 64.0 | 11.0  |
| 2              | .966                                             | .045                                                         | .873    | .172    | 68.9                          | 75.0                                                                | 63.2 | 11.8  |
| 3              | .958                                             | .039                                                         | .867    | .172    | 68.8                          | 74.8                                                                | 63.0 | 11.8  |
| 4              | .958                                             | .038                                                         | .856    | .182    | 67.8                          | 74.0                                                                | 62.3 | 11.7  |
| 5              | .964                                             | .046                                                         | .867    | .179    | 67.5                          | 74.4                                                                | 62.0 | 12.4  |
| 6              | .982                                             | .059                                                         | .881    | .178    | 67.0                          | 74.8                                                                | 61.2 | 13.6  |
| 7              | 30.006                                           | .089                                                         | .902    | .187    | 66.9                          | 74.0                                                                | 61.0 | 13.0  |
| 8              | .037                                             | .123                                                         | .942    | .181    | 69.6                          | 76.0                                                                | 65.5 | 10.5  |
| 9              | .057                                             | .138                                                         | .958    | .180    | 72.8                          | 78.4                                                                | 69.0 | 9.4   |
| 10             | .065                                             | .146                                                         | .963    | .183    | 75.6                          | 81.0                                                                | 70.6 | 10.4  |
| 11             | .051                                             | .126                                                         | .954    | .172    | 78.4                          | 82.8                                                                | 74.0 | 8.8   |
| Noon.          | .024                                             | .114                                                         | .911    | .203    | 81.1                          | 85.4                                                                | 77.0 | 8.4   |
| 1              | 29.987                                           | .081                                                         | .881    | .200    | 83.1                          | 87.9                                                                | 78.6 | 9.3   |
| 2              | .956                                             | .050                                                         | .855    | .195    | 84.0                          | 88.9                                                                | 79.6 | 9.3   |
| 3              | .932                                             | .023                                                         | .838    | .185    | 84.5                          | 89.6                                                                | 80.6 | 9.0   |
| 4              | .921                                             | .013                                                         | .825    | .188    | 83.5                          | 89.3                                                                | 79.2 | 10.1  |
| 5              | .921                                             | .017                                                         | .826    | .191    | 82.1                          | 87.2                                                                | 78.4 | 8.8   |
| 6              | .925                                             | .028                                                         | .823    | .205    | 79.2                          | 84.5                                                                | 75.6 | 8.9   |
| 7              | .939                                             | .037                                                         | .845    | .192    | 76.8                          | 81.9                                                                | 72.6 | 9.3   |
| 8              | .964                                             | .058                                                         | .854    | .204    | 74.6                          | 79.2                                                                | 70.0 | 9.2   |
| 9              | .980                                             | .071                                                         | .884    | .187    | 73.3                          | 78.0                                                                | 68.8 | 9.2   |
| 10             | .990                                             | .077                                                         | .898    | .179    | 71.9                          | 76.6                                                                | 68.0 | 8.6   |
| 11             | .987                                             | .062                                                         | .883    | .179    | 71.1                          | 75.9                                                                | 66.6 | 9.3   |

The Mean height of the Barometer, as likewise the Mean Dry and Wet Bulb Thermometers are derived from the observations made at the several hours during the month.

*Abstract of the Results of the Hourly Meteorological Observations  
taken at the Surveyor General's Office, Calcutta,  
in the month of February, 1859.*

Hourly Means, &c. of the Observations and of the Hygrometrical elements  
dependent thereon.—(Continued.)

| Hour.          | Mean Wet Bulb Ther-<br>mometer. | Dry Bulb above Wet. | Computed Dew Point. | Dry Bulb above Dew<br>Point. | Mean Elastic Force<br>of Vapour. | Mean Weight of Va-<br>pour in a cubic<br>foot of Air. | Additional Weight of<br>Vapour required<br>for complete satu-<br>ration. | Mean degree of Hu-<br>midity, complete<br>saturation being<br>unity. |
|----------------|---------------------------------|---------------------|---------------------|------------------------------|----------------------------------|-------------------------------------------------------|--------------------------------------------------------------------------|----------------------------------------------------------------------|
|                | o                               | o                   | o                   | o                            | Inches.                          | T. gr.                                                | T. gr.                                                                   |                                                                      |
| Mid-<br>night. | 66.5                            | 3.7                 | 64.6                | 5.6                          | 0.609                            | 6.70                                                  | 1.35                                                                     | 0.83                                                                 |
| 1              | 66.0                            | 3.6                 | 64.2                | 5.4                          | .601                             | .62                                                   | .28                                                                      | .84                                                                  |
| 2              | 65.7                            | 3.2                 | 64.1                | 4.8                          | .599                             | .60                                                   | .14                                                                      | .85                                                                  |
| 3              | 65.7                            | 3.1                 | 64.1                | 4.7                          | .599                             | .60                                                   | .11                                                                      | .86                                                                  |
| 4              | 64.7                            | 3.1                 | 62.8                | 5.0                          | .574                             | .35                                                   | .13                                                                      | .85                                                                  |
| 5              | 64.5                            | 3.0                 | 62.7                | 4.8                          | .572                             | .33                                                   | .09                                                                      | .85                                                                  |
| 6              | 64.1                            | 2.9                 | 62.4                | 4.6                          | .567                             | .27                                                   | .03                                                                      | .86                                                                  |
| 7              | 63.9                            | 3.0                 | 62.1                | 4.8                          | .561                             | .21                                                   | .07                                                                      | .85                                                                  |
| 8              | 65.2                            | 4.4                 | 63.0                | 6.6                          | .578                             | .36                                                   | .54                                                                      | .81                                                                  |
| 9              | 67.1                            | 5.7                 | 64.2                | 8.6                          | .601                             | .57                                                   | 2.14                                                                     | .75                                                                  |
| 10             | 68.4                            | 7.2                 | 64.8                | 10.8                         | .613                             | .68                                                   | .80                                                                      | .71                                                                  |
| 11             | 69.0                            | 9.4                 | 64.3                | 14.1                         | .603                             | .53                                                   | 3.78                                                                     | .63                                                                  |
|                |                                 |                     |                     |                              |                                  |                                                       |                                                                          |                                                                      |
| Noon.          | 70.0                            | 11.1                | 64.4                | 16.7                         | .605                             | .51                                                   | 4.66                                                                     | .58                                                                  |
| 1              | 70.2                            | 12.9                | 63.7                | 19.4                         | .591                             | .34                                                   | 5.52                                                                     | .54                                                                  |
| 2              | 70.1                            | 13.9                | 63.1                | 20.9                         | .580                             | .20                                                   | .97                                                                      | .51                                                                  |
| 3              | 70.4                            | 14.1                | 63.3                | 21.2                         | .584                             | .24                                                   | 6.11                                                                     | .51                                                                  |
| 4              | 69.9                            | 13.6                | 63.1                | 20.4                         | .580                             | .21                                                   | 5.79                                                                     | .52                                                                  |
| 5              | 70.0                            | 12.1                | 63.9                | 18.2                         | .595                             | .39                                                   | .12                                                                      | .56                                                                  |
| 6              | 70.2                            | 9.0                 | 65.7                | 13.5                         | .632                             | .82                                                   | 3.74                                                                     | .65                                                                  |
| 7              | 69.5                            | 7.3                 | 65.8                | 11.0                         | .634                             | .89                                                   | 2.94                                                                     | .70                                                                  |
| 8              | 68.5                            | 6.1                 | 65.4                | 9.2                          | .626                             | .82                                                   | .38                                                                      | .74                                                                  |
| 9              | 68.0                            | 5.3                 | 65.3                | 8.0                          | .623                             | .82                                                   | .02                                                                      | .77                                                                  |
| 10             | 67.4                            | 4.5                 | 65.1                | 6.8                          | .619                             | .79                                                   | 1.69                                                                     | .80                                                                  |
| 11             | 66.9                            | 4.2                 | 64.8                | 6.3                          | .613                             | .75                                                   | .53                                                                      | .82                                                                  |

All the Hygrometrical elements are computed by the Greenwich constants.



*Abstract of the Results of the Hourly Meteorological Observations  
taken at the Surveyor General's Office, Calcutta,  
in the month of February, 1859.  
Solar Radiation, Weather, &c.*

| Date. | Max. Solar radiation. | Rain Gauge 5 feet above Ground. | Prevailing direction of the Wind. | General Aspect of the Sky.                                                                                                                               |
|-------|-----------------------|---------------------------------|-----------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------|
|       | o                     | Inches.                         |                                   |                                                                                                                                                          |
| 1     | 141.0                 | ..                              | N. & S. W. & S.                   | Cloudless.                                                                                                                                               |
| 2     | 141.6                 | ..                              | S. W. & W.                        | Cloudless.                                                                                                                                               |
| 3     | 141.0                 | ..                              | S. W. & W.                        | Cloudless.                                                                                                                                               |
| 4     | 135.0                 | ..                              | W. & N. W.                        | Cloudless.                                                                                                                                               |
| 5     | 140.0                 | ..                              | W. & N. W. & S. W.                | Cloudless.                                                                                                                                               |
| 6     | <i>Sunday.</i>        |                                 |                                   |                                                                                                                                                          |
| 7     | 129.0                 | ..                              | S. E. & N. & S. W.                | Cloudless, also foggy between 3 and 10 A. M.                                                                                                             |
| 8     | 142.3                 | ..                              | S.                                | Cloudless, also foggy between 2 and 7 A. M.                                                                                                              |
| 9     | 140.0                 | ..                              | S.                                | Cloudless.                                                                                                                                               |
| 10    | 136.4                 | ..                              | S. & S. E. & E.                   | Cloudless till 6 A. M. Scatd. \i and \i till 6 P. M. cloudless afterwards.                                                                               |
| 11    | 136.5                 | ..                              | N. E. & N. & S.                   | Cloudless till 5 A. M. Scatd. \i and \i till 2 P. M. cloudless afterwards.                                                                               |
| 12    | 140.0                 | ..                              | N. E.                             | Cloudless.                                                                                                                                               |
| 13    | <i>Sunday.</i>        |                                 |                                   |                                                                                                                                                          |
| 14    | 135.6                 | ..                              | N.                                | Cloudless till 5 A. M. Scatd. \i till 11 A. M. cloudless afterwards.                                                                                     |
| 15    | 139.0                 | ..                              | N. & W.                           | Cloudless.                                                                                                                                               |
| 16    | 139.0                 | ..                              | N. & W.                           | Cloudless.                                                                                                                                               |
| 17    | 136.0                 | ..                              | W. & S. & N.                      | Cloudless.                                                                                                                                               |
| 18    | 140.0                 | ..                              | W. & N. W.                        | Cloudless till 8 A. M. Scatd. \i and \i till 1 P. M. cloudless afterwards.                                                                               |
| 19    | 139.0                 | ..                              | S. W. & S.                        | Cloudless till 7 A. M. Scatd. \i till 3 P. M. cloudless afterwards; also foggy between 3 and 7 A. M.                                                     |
| 20    | <i>Sunday.</i>        |                                 |                                   |                                                                                                                                                          |
| 21    | 147.0                 | ..                              | S. & W.                           | Cloudy till 7 A. M. cloudless afterwards; also slightly drizzling between midnight and 1 A. M.                                                           |
| 22    | 140.0                 | ..                              | S. & S. E.                        | Scatd. clouds till 8 A. M. cloudless afterwards.                                                                                                         |
| 23    | 131.5                 | ..                              | N. E. & S. & N. W. & N.           | Cloudless till 5 A. M. Scatd. \i till 2 P. M. cloudless afterwards.                                                                                      |
| 24    | 139.4                 | 0.66                            | S. & S. E.                        | Cloudless till Noon. Scatd. \i till 9 P. M. cloudless afterwards; also a S. E. gale with thunder, lightning and rain between 7h. 20m. and 7h. 40m. P. M. |

\i Cirri, \i Cirro strati, \i Cumuli, \i Cumulo strati, \i Nimbi, —i Strati, \i Cirro cumuli.

*Abstract of the Results of the Hourly Meteorological Observations  
taken at the Surveyor General's Office, Calcutta,  
in the Month of February, 1859.*

Solar Radiation, Weather, &c.

| Date. | Max. Solar radiation. | Rain Gauge 5 feet above Ground. | Prevailing direction of the Wind. | General Aspect of the Sky.                                                |
|-------|-----------------------|---------------------------------|-----------------------------------|---------------------------------------------------------------------------|
|       | o                     | Inches.                         |                                   |                                                                           |
| 25    | 129.0                 | ..                              | N. W. & other wind.               | Cloudy.                                                                   |
| 26    | 135.0                 | ..                              | N. W. & S. E. & W.                | Cloudless till 6 A. M. Scatd $\cap$ i and $\cup$ i afterwards.            |
| 27    | <i>Sunday.</i>        |                                 |                                   |                                                                           |
| 28    | 136.0                 | ..                              | S.                                | Cloudless till 8 A. M. Scatd. $\cup$ i till 4 P. M. cloudless afterwards. |

*Abstract of the Results of the Hourly Meteorological Observations  
taken at the Surveyor General's Office, Calcutta,  
in the month of February, 1859.*

MONTHLY RESULTS.

|                                                                |    |    | Inches. |
|----------------------------------------------------------------|----|----|---------|
| Mean height of the Barometer for the month,                    | .. | .. | 29.980  |
| Max. height of the Barometer occurred at 10 A. M. on the 15th, | .. | .. | 30.146  |
| Min. height of the Barometer occurred at 6 P. M. on the 28th,  | .. | .. | 29.823  |
| Extreme range of the Barometer during the month,               | .. | .. | 0.323   |
| Mean of the daily Max. Pressures,                              | .. | .. | 30.066  |
| Ditto ditto Min. ditto,                                        | .. | .. | 29.917  |
| Mean daily range of the Barometer during the month,            | .. | .. | 0.149   |

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|                                                            |    |    | °    |
|------------------------------------------------------------|----|----|------|
| Mean Dry Bulb Thermometer for the month,                   | .. | .. | 74.6 |
| Max. Temperature occurred at 3 P. M. on the 22nd,          | .. | .. | 89.6 |
| Min. Temperature occurred at 7 A. M. on the 16th and 17th, | .. | .. | 61.0 |
| Extreme range of the Temperature during the month,         | .. | .. | 28.6 |
| Mean of the daily Max. Temperature,                        | .. | .. | 84.6 |
| Ditto ditto Min. ditto,                                    | .. | .. | 66.6 |
| Mean daily range of the Temperature during the month,      | .. | .. | 18.0 |

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|                                                            |    |    | °    |
|------------------------------------------------------------|----|----|------|
| Mean Wet Bulb Thermometer for the month,                   | .. | .. | 67.6 |
| Mean Dry Bulb Thermometer above Mean Wet Bulb Thermometer, | .. | .. | 7.0  |
| Computed Mean Dew-point for the month,                     | .. | .. | 64.1 |
| Mean Dry Bulb Thermometer above computed mean Dew-point,   | .. | .. | 10.5 |

|                                             |    |    | Inches. |
|---------------------------------------------|----|----|---------|
| Mean Elastic force of Vapour for the month, | .. | .. | 0.599   |

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|                                                                         |    |    | Troy grains. |
|-------------------------------------------------------------------------|----|----|--------------|
| Mean Weight of Vapour for the month,                                    | .. | .. | 6.52         |
| Additional Weight of Vapour required for complete saturation,           | .. | .. | 2.68         |
| Mean degree of humidity for the month, complete saturation being unity, | .. | .. | 0.71         |

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|                                                   |    |    | Inches.      |
|---------------------------------------------------|----|----|--------------|
| Rained 2 days, Max. fall of rain during 24 hours, | .. | .. | 0.66         |
| Total amount of rain during the month,            | .. | .. | 0.66         |
| Prevailing direction of the Wind,                 | .. | .. | S. & W. & N. |

*Abstract of the Results of the Hourly Meteorological Observations  
taken at the Surveyor General's Office, Calcutta,  
in the month of February, 1859.*

MONTHLY RESULTS.

Table showing the number of days on which at a given hour any particular wind  
blew, together with the number of days on which at the same hour when  
any particular wind was blowing, it rained.

| Hour.     | N.           | Rain on.<br>N. E. | Rain on.<br>E. | Rain on.<br>S. E. | Rain on.<br>S. | Rain on.<br>S. W. | Rain on.<br>W. | Rain on.<br>N. W. | Rain on.<br>Calm. | Rain on.<br>Missed. |
|-----------|--------------|-------------------|----------------|-------------------|----------------|-------------------|----------------|-------------------|-------------------|---------------------|
|           | No. of days. |                   |                |                   |                |                   |                |                   |                   |                     |
| Midnight. | 3            |                   |                | 2                 | 11             |                   |                | 1                 |                   |                     |
| 1         | 3            |                   |                | 2                 | 11             | 1                 | 5              | 2                 | 1                 |                     |
| 2         | 3            |                   |                | 2                 | 11             |                   | 5              | 2                 | 1                 |                     |
| 3         | 3            |                   |                | 2                 | 10             |                   | 4              | 3                 |                   | 2                   |
| 4         | 3            |                   |                | 2                 | 9              |                   | 5              | 4                 |                   | 1                   |
| 5         | 4            |                   |                | 2                 | 9              |                   | 5              | 2                 |                   | 2                   |
| 6         | 5            | 1                 |                | 2                 | 8              |                   | 3              | 4                 | 1                 |                     |
| 7         | 5            | 1                 | 1              | 2                 | 7              |                   | 3              | 4                 | 1                 |                     |
| 8         | 6            |                   |                | 4                 | 6              |                   | 3              | 1                 | 4                 |                     |
| 9         | 6            | 1                 | 2              | 3                 | 5              |                   | 2              | 2                 | 3                 |                     |
| 10        | 6            | 2                 | 2              | 3                 | 4              |                   | 2              | 3                 | 2                 |                     |
| 11        | 5            | 3                 | 2              | 2                 | 3              |                   | 4              | 1                 | 4                 |                     |
| Noon.     | 7            | 3                 | 1              | 2                 | 5              |                   | 2              | 2                 | 2                 |                     |
| 1         | 5            | 2                 | 1              | 2                 | 5              |                   | 1              | 4                 | 4                 |                     |
| 2         | 3            | 2                 |                | 3                 | 3              |                   | 2              | 6                 | 5                 |                     |
| 3         | 3            | 2                 |                | 3                 | 3              |                   | 1              | 8                 | 4                 |                     |
| 4         | 4            | 2                 |                | 2                 | 4              |                   |                | 7                 | 5                 |                     |
| 5         | 2            | 4                 | 1              |                   | 3              |                   | 2              | 10                | 2                 |                     |
| 6         | 2            | 4                 | 1              |                   | 4              |                   | 2              | 10                | 1                 |                     |
| 7         | 2            | 3                 | 1              |                   | 6              |                   | 3              | 6                 | 3                 |                     |
| 8         | 2            | 3                 |                | 1                 | 5              |                   | 4              | 6                 | 3                 |                     |
| 9         | 3            | 3                 |                | 1                 | 6              |                   | 4              | 4                 | 3                 |                     |
| 10        | 3            | 3                 |                |                   | 7              |                   | 3              | 5                 | 3                 |                     |
| 11        | 3            | 3                 |                |                   | 7              |                   | 3              | 5                 | 3                 |                     |

*Abstract of the Results of the Hourly Meteorological Observations  
taken at the Surveyor General's Office, Calcutta,  
in the month of March, 1859.*

Latitude 22° 33' 1" North. Longitude 88° 20' 34" East.

Height of the Cistern of the Standard Barometer above the Sea level, 18.11 feet.

Daily Means, &c. of the Observations and of the Hygrometrical elements  
dependent thereon.

| Date. | Mean Height of<br>the Barometer<br>at 32° Fahr. | Range of the Barometer<br>during the day. |         |         | Mean Dry Bulb<br>Thermometer. | Range of the Tempera-<br>ture during the day. |      |       |
|-------|-------------------------------------------------|-------------------------------------------|---------|---------|-------------------------------|-----------------------------------------------|------|-------|
|       |                                                 | Max.                                      | Min.    | Diff.   |                               | Max.                                          | Min. | Diff. |
|       | Inches.                                         | Inches.                                   | Inches. | Inches. | o                             | o                                             | o    | o     |
| 1     | 29.824                                          | 29.898                                    | 29.745  | 0.153   | 79.4                          | 89.6                                          | 71.2 | 18.4  |
| 2     | .795                                            | .867                                      | .736    | .131    | 76.9                          | 87.6                                          | 72.3 | 15.3  |
| 3     | .838                                            | .893                                      | .780    | .113    | 72.9                          | 80.0                                          | 68.8 | 11.2  |
| 4     | .862                                            | .948                                      | .807    | .141    | 67.2                          | 70.0                                          | 63.4 | 6.6   |
| 5     | .849                                            | .922                                      | .807    | .115    | 67.6                          | 73.2                                          | 63.6 | 9.6   |
| 6     | <i>Sunday.</i>                                  |                                           |         |         |                               |                                               |      |       |
| 7     | .867                                            | .940                                      | .808    | .132    | 73.3                          | 79.8                                          | 69.3 | 10.5  |
| 8     | .855                                            | .922                                      | .809    | .113    | 73.9                          | 83.2                                          | 66.5 | 16.7  |
| 9     | .830                                            | .906                                      | .762    | .144    | 77.2                          | 86.3                                          | 70.4 | 15.9  |
| 10    | .810                                            | .867                                      | .756    | .111    | 79.0                          | 86.8                                          | 73.2 | 13.6  |
| 11    | .854                                            | .934                                      | .791    | .143    | 79.6                          | 87.6                                          | 75.0 | 12.6  |
| 12    | .886                                            | .979                                      | .833    | .146    | 79.7                          | 88.0                                          | 73.8 | 14.2  |
| 13    | <i>Sunday.</i>                                  |                                           |         |         |                               |                                               |      |       |
| 14    | .766                                            | .851                                      | .719    | .132    | 79.2                          | 87.0                                          | 74.0 | 13.0  |
| 15    | .826                                            | .909                                      | .763    | .146    | 76.9                          | 85.4                                          | 70.6 | 14.8  |
| 16    | .860                                            | .952                                      | .814    | .138    | 76.6                          | 86.1                                          | 68.6 | 17.5  |
| 17    | .846                                            | .925                                      | .770    | .155    | 78.6                          | 88.6                                          | 70.4 | 18.2  |
| 18    | .862                                            | .935                                      | .805    | .130    | 80.2                          | 91.4                                          | 72.2 | 19.2  |
| 19    | .896                                            | .972                                      | .830    | .142    | 81.3                          | 90.4                                          | 74.2 | 16.2  |
| 20    | <i>Sunday.</i>                                  |                                           |         |         |                               |                                               |      |       |
| 21    | .958                                            | 30.041                                    | .893    | .148    | 82.4                          | 90.2                                          | 76.6 | 13.6  |
| 22    | .952                                            | .027                                      | .887    | .140    | 81.3                          | 91.0                                          | 73.6 | 17.4  |
| 23    | .977                                            | .069                                      | .903    | .166    | 80.4                          | 90.8                                          | 74.2 | 16.6  |
| 24    | .937                                            | .010                                      | .872    | .138    | 81.6                          | 92.0                                          | 73.6 | 18.4  |
| 25    | .894                                            | 29.959                                    | .817    | .142    | 81.7                          | 91.4                                          | 74.8 | 16.6  |
| 26    | .891                                            | .950                                      | .838    | .112    | 82.4                          | 89.6                                          | 77.4 | 12.2  |
| 27    | <i>Sunday.</i>                                  |                                           |         |         |                               |                                               |      |       |
| 28    | .912                                            | .992                                      | .837    | .155    | 84.6                          | 93.2                                          | 79.0 | 14.2  |
| 29    | .925                                            | .994                                      | .865    | .129    | 83.5                          | 89.6                                          | 78.6 | 11.0  |
| 30    | .955                                            | 30.055                                    | .867    | .188    | 83.2                          | 91.8                                          | 77.6 | 14.2  |
| 31    | .991                                            | .077                                      | .922    | .155    | 84.1                          | 93.3                                          | 76.2 | 17.1  |

The Mean height of the Barometer, as likewise the Mean Dry and Wet Bulb Thermometers are derived from the twenty-four hourly observations made during the day.

*Abstract of the Results of the Hourly Meteorological Observations  
taken at the Surveyor General's Office, Calcutta,  
in the month of March, 1859.*

Daily Means, &c. of the Observations and of the Hygrometrical elements  
dependent thereon.—(Continued.)

| Date. | Mean Wet Bulb Thermo-<br>meter. | Dry Bulb above Wet. | Computed Dew Point. | Dry Bulb above Dew<br>Point. | Mean Elastic force of<br>Vapour. | Mean Weight of Vapour<br>in a cubic foot of Air. | Additional Weight of Va-<br>pour required for com-<br>plete saturation. | Mean degree of Humidity,<br>complete saturation be-<br>ing unity. |
|-------|---------------------------------|---------------------|---------------------|------------------------------|----------------------------------|--------------------------------------------------|-------------------------------------------------------------------------|-------------------------------------------------------------------|
|       | o                               | o                   | o                   | o                            | Inches.                          | T. gr.                                           | T. gr.                                                                  |                                                                   |
| 1     | 72.3                            | 7.1                 | 68.7                | 10.7                         | .697                             | 7.52                                             | 3.10                                                                    | .71                                                               |
| 2     | 73.3                            | 3.6                 | 71.5                | 5.4                          | .763                             | 8.30                                             | 1.56                                                                    | .84                                                               |
| 3     | 69.5                            | 3.4                 | 67.8                | 5.1                          | .677                             | 7.41                                             | .32                                                                     | .85                                                               |
| 4     | 64.9                            | 2.3                 | 63.5                | 3.7                          | .588                             | 6.50                                             | 0.85                                                                    | .88                                                               |
| 5     | 65.5                            | 2.1                 | 64.2                | 3.4                          | .601                             | .65                                              | .79                                                                     | .89                                                               |
| 6     | <i>Sunday.</i>                  |                     |                     |                              |                                  |                                                  |                                                                         |                                                                   |
| 7     | 69.5                            | 3.8                 | 67.6                | 5.7                          | .672                             | 7.35                                             | 1.49                                                                    | .83                                                               |
| 8     | 69.1                            | 4.8                 | 66.7                | 7.2                          | .653                             | .13                                              | .88                                                                     | .79                                                               |
| 9     | 71.2                            | 6.0                 | 68.2                | 9.0                          | .686                             | .44                                              | 2.51                                                                    | .75                                                               |
| 10    | 73.5                            | 5.5                 | 70.7                | 8.3                          | .744                             | 8.05                                             | .45                                                                     | .77                                                               |
| 11    | 73.7                            | 5.9                 | 70.7                | 8.9                          | .744                             | .03                                              | .66                                                                     | .75                                                               |
| 12    | 73.4                            | 6.3                 | 70.2                | 9.5                          | .732                             | 7.89                                             | .83                                                                     | .74                                                               |
| 13    | <i>Sunday.</i>                  |                     |                     |                              |                                  |                                                  |                                                                         |                                                                   |
| 14    | 71.2                            | 8.0                 | 67.2                | 12.0                         | .664                             | .17                                              | 3.39                                                                    | .68                                                               |
| 15    | 67.3                            | 9.6                 | 62.5                | 14.4                         | .568                             | 6.17                                             | .69                                                                     | .63                                                               |
| 16    | 66.2                            | 10.4                | 61.0                | 15.6                         | .541                             | 5.87                                             | .90                                                                     | .60                                                               |
| 17    | 70.0                            | 8.6                 | 65.7                | 12.9                         | .632                             | 6.84                                             | .54                                                                     | .66                                                               |
| 18    | 71.8                            | 8.4                 | 67.6                | 12.6                         | .672                             | 7.25                                             | .63                                                                     | .67                                                               |
| 19    | 76.7                            | 4.6                 | 74.4                | 6.9                          | .838                             | 9.02                                             | 2.22                                                                    | .80                                                               |
| 20    | <i>Sunday.</i>                  |                     |                     |                              |                                  |                                                  |                                                                         |                                                                   |
| 21    | 73.0                            | 9.4                 | 68.3                | 14.1                         | .688                             | 7.39                                             | 4.22                                                                    | .64                                                               |
| 22    | 70.0                            | 11.3                | 64.3                | 17.0                         | .603                             | 6.49                                             | .75                                                                     | .58                                                               |
| 23    | 72.4                            | 8.0                 | 68.4                | 12.0                         | .690                             | 7.44                                             | 3.50                                                                    | .68                                                               |
| 24    | 73.7                            | 7.9                 | 69.7                | 11.9                         | .720                             | .74                                              | .60                                                                     | .68                                                               |
| 25    | 76.1                            | 5.6                 | 73.3                | 8.4                          | .809                             | 8.70                                             | 2.67                                                                    | .77                                                               |
| 26    | 77.9                            | 4.5                 | 75.6                | 6.8                          | .871                             | 9.35                                             | .26                                                                     | .81                                                               |
| 27    | <i>Sunday.</i>                  |                     |                     |                              |                                  |                                                  |                                                                         |                                                                   |
| 28    | 76.3                            | 8.3                 | 72.1                | 12.5                         | .770                             | 8.31                                             | 4.08                                                                    | .67                                                               |
| 29    | 78.6                            | 4.9                 | 76.1                | 7.4                          | .885                             | 9.50                                             | 2.50                                                                    | .79                                                               |
| 30    | 74.6                            | 8.6                 | 70.3                | 12.9                         | .734                             | 7.87                                             | 4.02                                                                    | .66                                                               |
| 31    | 75.3                            | 8.8                 | 70.9                | 13.2                         | .748                             | 8.02                                             | .19                                                                     | .66                                                               |

All the Hygrometrical elements are computed by the Greenwich constants.

*Abstract of the Results of the Hourly Meteorological Observations  
taken at the Surveyor General's Office, Calcutta,  
in the month of March, 1859.*

Hourly Means, &c. of the Observations and of the Hygrometrical elements  
dependent thereon.

| Hour.          | Mean Height of<br>the Barometer<br>at 32° Fahrt. | Range of the Barometer for<br>each hour during the<br>month. |         |         | Mean Dry Bulb<br>Thermometer. | Range of the Tempera-<br>ture for each hour<br>during the<br>month. |      |       |
|----------------|--------------------------------------------------|--------------------------------------------------------------|---------|---------|-------------------------------|---------------------------------------------------------------------|------|-------|
|                |                                                  | Max.                                                         | Min.    | Diff.   |                               | Max.                                                                | Min. | Diff. |
|                | Inches.                                          | Inches.                                                      | Inches. | Inches. | o                             | o                                                                   | o    | o     |
| Mid-<br>night. | 29.876                                           | 29.978                                                       | 29.738  | 0.240   | 75.2                          | 81.7                                                                | 64.0 | 17.7  |
| 1              | .864                                             | .972                                                         | .731    | .241    | 74.6                          | 81.8                                                                | 64.4 | 17.4  |
| 2              | .852                                             | .953                                                         | .721    | .232    | 74.1                          | 80.5                                                                | 64.2 | 16.3  |
| 3              | .843                                             | .949                                                         | .719    | .230    | 73.6                          | 80.4                                                                | 64.6 | 15.8  |
| 4              | .845                                             | .974                                                         | .724    | .250    | 73.6                          | 80.2                                                                | 64.0 | 16.2  |
| 5              | .860                                             | .986                                                         | .744    | .242    | 73.4                          | 79.6                                                                | 63.8 | 15.8  |
| 6              | .874                                             | 30.017                                                       | .763    | .254    | 73.0                          | 79.3                                                                | 63.6 | 15.7  |
| 7              | .901                                             | .031                                                         | .779    | .252    | 73.2                          | 79.7                                                                | 64.0 | 15.7  |
| 8              | .932                                             | .055                                                         | .822    | .233    | 75.5                          | 81.8                                                                | 65.4 | 16.4  |
| 9              | .945                                             | .077                                                         | .841    | .236    | 77.9                          | 83.4                                                                | 66.0 | 17.4  |
| 10             | .951                                             | .071                                                         | .851    | .220    | 80.4                          | 85.4                                                                | 66.6 | 18.8  |
| 11             | .943                                             | .076                                                         | .838    | .238    | 82.7                          | 88.0                                                                | 66.2 | 21.8  |
| Noon.          | .921                                             | .032                                                         | .814    | .218    | 84.6                          | 91.2                                                                | 64.8 | 26.4  |
| 1              | .891                                             | 29.994                                                       | .792    | .202    | 85.9                          | 92.4                                                                | 65.4 | 27.0  |
| 2              | .860                                             | .966                                                         | .761    | .205    | 86.2                          | 92.6                                                                | 67.4 | 25.2  |
| 3              | .837                                             | .949                                                         | .734    | .215    | 86.3                          | 93.3                                                                | 69.8 | 23.5  |
| 4              | .832                                             | .929                                                         | .749    | .180    | 85.7                          | 93.0                                                                | 69.2 | 23.8  |
| 5              | .822                                             | .922                                                         | .723    | .199    | 84.2                          | 91.6                                                                | 68.6 | 23.0  |
| 6              | .833                                             | .926                                                         | .724    | .202    | 81.8                          | 88.8                                                                | 65.6 | 23.2  |
| 7              | .849                                             | .943                                                         | .719    | .224    | 79.7                          | 86.7                                                                | 65.0 | 21.7  |
| 8              | .872                                             | .983                                                         | .749    | .234    | 78.1                          | 84.8                                                                | 64.8 | 20.0  |
| 9              | .886                                             | 30.003                                                       | .761    | .242    | 77.1                          | 84.2                                                                | 65.8 | 18.4  |
| 10             | .896                                             | .005                                                         | .775    | .230    | 76.2                          | 82.0                                                                | 65.0 | 17.0  |
| 11             | .893                                             | .019                                                         | .782    | .237    | 75.6                          | 82.0                                                                | 63.4 | 18.6  |

The Mean height of the Barometer, as likewise the Mean Dry and Wet Bulb Thermometers are derived from the observations made at the several hours during the month.

*Abstract of the Results of the Hourly Meteorological Observations  
taken at the Surveyor General's Office, Calcutta,  
in the month of March, 1859.*

Hourly Means, &c. of the Observations and of the Hygrometrical elements  
dependent thereon.—(Continued.)

| Hour.          | Mean Wet Bulb Ther-<br>mometer. | Dry Bulb above Wet. | Computed Dew Point. | Dry Bulb above Dew<br>Point. | Mean Elastic Force<br>of Vapour. | Mean Weight of Va-<br>pour in a cubic<br>foot of Air. | Additional Weight of<br>Vapour required<br>for complete satu-<br>ration. | Mean degree of Hu-<br>midity, complete<br>saturation<br>being<br>unity. |
|----------------|---------------------------------|---------------------|---------------------|------------------------------|----------------------------------|-------------------------------------------------------|--------------------------------------------------------------------------|-------------------------------------------------------------------------|
|                | o                               | o                   | o                   | o                            | Inches.                          | T. gr.                                                | T. gr.                                                                   |                                                                         |
| Mid-<br>night. | 71.9                            | 3.3                 | 70.2                | 5.0                          | 0.732                            | 7.97                                                  | 1.40                                                                     | 0.85                                                                    |
| 1              | 71.6                            | 3.0                 | 70.1                | 4.5                          | .729                             | .95                                                   | .25                                                                      | .86                                                                     |
| 2              | 71.3                            | 2.8                 | 69.9                | 4.2                          | .725                             | .92                                                   | .15                                                                      | .87                                                                     |
| 3              | 70.9                            | 2.7                 | 69.5                | 4.1                          | .715                             | .82                                                   | .11                                                                      | .88                                                                     |
| 4              | 71.1                            | 2.5                 | 69.8                | 3.8                          | .722                             | .89                                                   | .04                                                                      | .88                                                                     |
| 5              | 70.8                            | 2.6                 | 69.5                | 3.9                          | .715                             | .82                                                   | .05                                                                      | .88                                                                     |
| 6              | 70.5                            | 2.5                 | 69.2                | 3.8                          | .708                             | .75                                                   | .01                                                                      | .89                                                                     |
| 7              | 70.7                            | 2.5                 | 69.4                | 3.8                          | .713                             | .80                                                   | .02                                                                      | .88                                                                     |
| 8              | 71.8                            | 3.7                 | 69.9                | 5.6                          | .725                             | .88                                                   | .58                                                                      | .83                                                                     |
| 9              | 72.4                            | 5.5                 | 69.6                | 8.3                          | .717                             | .77                                                   | 2.39                                                                     | .77                                                                     |
| 10             | 73.0                            | 7.4                 | 69.3                | 11.1                         | .711                             | .66                                                   | 3.28                                                                     | .70                                                                     |
| 11             | 73.3                            | 9.4                 | 68.6                | 14.1                         | .695                             | .46                                                   | 4.26                                                                     | .64                                                                     |
|                |                                 |                     |                     |                              |                                  |                                                       |                                                                          |                                                                         |
| Noon.          | 73.1                            | 11.5                | 67.3                | 17.3                         | .666                             | .12                                                   | 5.27                                                                     | .58                                                                     |
| 1              | 73.5                            | 12.4                | 67.3                | 18.6                         | .666                             | .09                                                   | .78                                                                      | .55                                                                     |
| 2              | 73.2                            | 13.0                | 66.7                | 19.5                         | .653                             | 6.94                                                  | 6.05                                                                     | .53                                                                     |
| 3              | 72.9                            | 13.4                | 66.2                | 20.1                         | .642                             | .84                                                   | .18                                                                      | .53                                                                     |
| 4              | 73.1                            | 12.6                | 66.8                | 18.9                         | .655                             | .98                                                   | 5.82                                                                     | .55                                                                     |
| 5              | 72.7                            | 11.5                | 66.9                | 17.3                         | .657                             | 7.03                                                  | .21                                                                      | .57                                                                     |
| 6              | 72.6                            | 9.2                 | 68.0                | 13.8                         | .681                             | .32                                                   | 4.08                                                                     | .64                                                                     |
| 7              | 72.6                            | 7.1                 | 69.0                | 10.7                         | .704                             | .59                                                   | 3.13                                                                     | .71                                                                     |
| 8              | 72.2                            | 5.9                 | 69.2                | 8.9                          | .708                             | .67                                                   | 2.55                                                                     | .75                                                                     |
| 9              | 71.9                            | 5.2                 | 69.3                | 7.8                          | .711                             | .70                                                   | .22                                                                      | .78                                                                     |
| 10             | 71.6                            | 4.6                 | 69.3                | 6.9                          | .711                             | .72                                                   | 1.94                                                                     | .80                                                                     |
| 11             | 71.5                            | 4.1                 | 69.4                | 6.2                          | .713                             | .77                                                   | .71                                                                      | .82                                                                     |

All the Hygrometrical elements are computed by the Greenwich constants.



*Abstract of the Results of the Hourly Meteorological Observations  
taken at the Surveyor General's Office, Calcutta,  
in the month of March, 1859.*

Solar Radiation, Weather, &c.

| Date. | Max. Solar radiation. | Rain Gauge 5 feet above Ground. | Prevailing direction of the Wind. | General Aspect of the Sky.                                                                                                       |
|-------|-----------------------|---------------------------------|-----------------------------------|----------------------------------------------------------------------------------------------------------------------------------|
|       | °                     | Inches.                         |                                   |                                                                                                                                  |
| 1     | 137.0                 | ..                              | S. & W.                           | Cloudless till 7 A. M. Scatd. \i till 1 P. M. cloudy till 7 P. M. cloudless afterwards.                                          |
| 2     | 129.0                 | 1.46                            | S. E. & S.                        | Cloudless till 4 A. M. cloudy afterwards; also raining at 2 and 3 and 6 and 7 P. M.                                              |
| 3     | ..                    | ..                              | N. E. & E.                        | Cloudy the whole day; also thundering and lightning between Midnight and 2 A. M.; also drizzling at 1 A. M. and 7 and 8 P. M.    |
| 4     | ..                    | 1.80                            | N. E. & E.                        | Cloudy the whole day; also thundering and lightning at 11 A. M. and constantly raining.                                          |
| 5     | ..                    | 0.97                            | N. E. & E.                        | Cloudy the whole day; also constantly raining; also thundering and lightning between 5 and 8 P. M.                               |
| 6     | <i>Sunday.</i>        |                                 |                                   |                                                                                                                                  |
| 7     | ..                    | ..                              | S. E.                             | Cloudy till 7 P. M. cloudless afterwards, also slightly drizzling between 1 and 2 P. M.                                          |
| 8     | 143.0                 | ..                              | S. E. & S. W.                     | Cloudless till 11 A. M. Scatd. \i till 4 P. M. cloudless afterwards; also foggy between 6 and 7 A. M.                            |
| 9     | 140.2                 | ..                              | S. & S. W.                        | Cloudless till Noon. Scatd. \i till 3 P. M. cloudless afterwards, also foggy between 4 and 7 A. M.                               |
| 10    | 131.0                 | ..                              | S. & N. W. & W.                   | Cloudless till 6 A. M. Scatd. \i and \i till 3 P. M. cloudless afterwards.                                                       |
| 11    | 135.0                 | ..                              | S. W. & S.                        | Cloudy till 7 A. M. Scatd. \i till 11 A. M. Scatd. \i till 7 P. M. cloudless afterwards; also very slightly drizzling at 1 A. M. |
| 12    | 139.4                 | ..                              | S. & S. W.                        | Cloudless till 5 A. M. Scatd. \i or \i till 11 A. M. cloudless afterwards.                                                       |
| 13    | <i>Sunday.</i>        |                                 |                                   |                                                                                                                                  |
| 14    | 133.2                 | ..                              | W. & S.                           | Cloudless.                                                                                                                       |
| 15    | 132.0                 | ..                              | W.                                | Cloudless.                                                                                                                       |
| 16    | 138.0                 | ..                              | S. & W. & S. W.                   | Cloudless.                                                                                                                       |
| 17    | 136.0                 | ..                              | S. & S. W.                        | Cloudless.                                                                                                                       |
| 18    | 139.0                 | ..                              | S. & S. W.                        | Cloudless till 11 A. M. Scatd. \i till 3 P. M. Scatd. \i till 6 P. M. cloudless afterwards.                                      |

\i Cirri, \i Cirro strati, \i Cumuli, \i Cumulo strati, \i Nimbi, —i Strati, \i Cirro cumuli.

*Abstract of the Results of the Hourly Meteorological Observations  
taken at the Surveyor General's Office, Calcutta,  
in the month of March, 1859.*

Solar Radiation, Weather, &c.

| Date. | Max. Solar radiation. | Rain Gauge 5 feet above Ground. | Prevailing direction of the Wind. | General Aspect of the Sky.                                                 |
|-------|-----------------------|---------------------------------|-----------------------------------|----------------------------------------------------------------------------|
|       | °                     | Inches.                         |                                   |                                                                            |
| 19    | 130.8                 | ..                              | S.                                | Cloudless.                                                                 |
| 20    | <i>Sunday.</i>        |                                 |                                   | [cloudless afterwards.                                                     |
| 21    | 139.9                 | ..                              | S. W. & W.                        | Cloudless till 2 A. M. cloudy till 7 A. M.                                 |
| 22    | 144.0                 | ..                              | N. W. & W.                        | Cloudless.                                                                 |
| 23    | 134.0                 | ..                              | S. & S. E.                        | Cloudless.                                                                 |
| 24    | 137.2                 | ..                              | S. & S. W.                        | Cloudless.                                                                 |
| 25    | 136.0                 | ..                              | S.                                | Scatd. \i till 7 A. M. cloudless afterwards.                               |
| 26    | 130.0                 | ..                              | S.                                | Scatd. clouds.                                                             |
| 27    | <i>Sunday.</i>        |                                 |                                   |                                                                            |
| 28    | 136.0                 | ..                              | S. & N. E.                        | Scatd. \i till 9 A. M. Scatd. \i till 7 P. M. cloudless afterwards.        |
| 29    | ..                    | ..                              | S.                                | Cloudless till 3 A. M. Scatd. clouds till 9 P. M. cloudless afterwards.    |
| 30    | 134.0                 | ..                              | S.                                | Cloudless till 4 A. M. cloudy till 11 A. M. cloudless afterwards.          |
| 31    | 134.9                 | ..                              | E. & S.                           | Cloudless till 5 A. M. Scatd. \i and \i till 8 P. M. cloudless afterwards. |

*Abstract of the Results of the Hourly Meteorological Observations  
taken at the Surveyor General's Office, Calcutta,  
in the month of March, 1859.*

MONTHLY RESULTS.

|                                                                           |        |    | Inches. |
|---------------------------------------------------------------------------|--------|----|---------|
| Mean height of the Barometer for the month,                               | ..     | .. | 29.878  |
| Max. height of the Barometer occurred at 9 A. M. on the 31st,             | ..     | .. | 30.077  |
| Min. height of the Barometer occurred at 3 A. M. and 7 P. M. on the 14th, | 29.719 |    |         |
| <i>Extreme range</i> of the Barometer during the month,                   | ..     | .. | 0.358   |
| Mean of the daily Max. Pressures,                                         | ..     | .. | 29.955  |
| Ditto ditto Min. ditto,                                                   | ..     | .. | 29.816  |
| <i>Mean daily range</i> of the Barometer during the month,                | ..     | .. | 0.139   |

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|                                                              |    |    | o    |
|--------------------------------------------------------------|----|----|------|
| Mean Dry Bulb Thermometer for the month,                     | .. | .. | 78.7 |
| Max. Temperature occurred at 3 P. M. on the 31st,            | .. | .. | 93.3 |
| Min. Temperature occurred at 11 P. M. on the 4th,            | .. | .. | 63.4 |
| <i>Extreme range</i> of the Temperature during the month,    | .. | .. | 29.9 |
| Mean of the daily Max. Temperature,                          | .. | .. | 87.2 |
| Ditto ditto Min. ditto,                                      | .. | .. | 72.6 |
| <i>Mean daily range</i> of the Temperature during the month, | .. | .. | 14.6 |

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|                                                            |    |    | o    |
|------------------------------------------------------------|----|----|------|
| Mean Wet Bulb Thermometer for the month,                   | .. | .. | 72.1 |
| Mean Dry Bulb Thermometer above Mean Wet Bulb Thermometer, | .. | .. | 6.6  |
| Computed Mean Dew-point for the month,                     | .. | .. | 68.8 |
| Mean Dry Bulb Thermometer above computed mean Dew-point,   | .. | .. | 9.9  |

|                                             |    |    | Inches |
|---------------------------------------------|----|----|--------|
| Mean Elastic force of Vapour for the month, | .. | .. | 0.699  |

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|                                                                         |    |    | Troy grains. |
|-------------------------------------------------------------------------|----|----|--------------|
| Mean Weight of Vapour for the month,                                    | .. | .. | 7.56         |
| Additional Weight of Vapour required for complete saturation,           | .. | .. | 2.85         |
| Mean degree of humidity for the month, complete saturation being unity, | .. | .. | 0.73         |

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|                                                   |    |    | Inches.         |
|---------------------------------------------------|----|----|-----------------|
| Rained 6 days, Max. fall of rain during 24 hours, | .. | .. | 1.80            |
| Total amount of rain during the month,            | .. | .. | 4.23            |
| Prevailing direction of the Wind,                 | .. | .. | S. & S. W. & W. |

*Abstract of the Results of the Hourly Meteorological Observations  
taken at the Surveyor General's Office, Calcutta,  
in the month of March, 1859.*

MONTHLY RESULTS.

Table showing the number of days on which at a given hour any particular wind blew, together with the number of days on which at the same hour when any particular wind was blowing, it rained.

| Hour.     | N.           | Rain on.<br>N. E. | Rain on.<br>E. | Rain on.<br>S. E. | Rain on.<br>S. | Rain on.<br>S. W. | Rain on.<br>W. | Rain on.<br>N. W. | Rain on.<br>Calm. | Rain on.<br>Missed. |
|-----------|--------------|-------------------|----------------|-------------------|----------------|-------------------|----------------|-------------------|-------------------|---------------------|
|           | No. of days. |                   |                |                   |                |                   |                |                   |                   |                     |
| Midnight. |              | 1                 | 1              | 2                 | 1              | 3                 | 17             |                   |                   |                     |
| 1         |              | 1                 | 1              | 2                 | 1              | 2                 | 18             | 1                 |                   |                     |
| 2         |              | 1                 | 1              | 2                 |                | 3                 | 17             |                   |                   |                     |
| 3         |              | 1                 | 1              | 2                 |                | 3                 | 15             |                   |                   |                     |
| 4         |              |                   |                | 3                 |                | 2                 | 13             |                   | 1                 | 2                   |
| 5         |              |                   |                | 2                 |                | 4                 | 12             |                   | 1                 | 1                   |
| 6         |              |                   |                | 3                 |                | 3                 | 8              |                   | 1                 |                     |
| 7         | 2            |                   |                | 3                 |                | 4                 | 6              |                   | 1                 |                     |
| 8         | 1            | 1                 |                | 4                 |                | 3                 | 8              |                   | 1                 |                     |
| 9         | 2            |                   | 1              | 3                 |                | 2                 | 8              |                   |                   |                     |
| 10        | 3            |                   | 1              |                   |                | 1                 | 7              |                   |                   |                     |
| 11        | 1            |                   |                | 1                 |                | 2                 | 6              |                   |                   | 1                   |
| Noon.     | 1            | 1                 | 2              | 1                 | 3              | 3                 | 9              | 1                 |                   | 1                   |
| 1         |              | 3                 | 1              |                   | 3              | 1                 | 4              |                   |                   |                     |
| 2         | 2            | 1                 |                |                   | 3              |                   | 5              |                   |                   |                     |
| 3         | 1            | 2                 | 1              | 1                 |                |                   | 7              |                   |                   |                     |
| 4         | 1            | 4                 | 1              | 1                 |                |                   | 6              |                   |                   | 1                   |
| 5         | 1            | 3                 | 3              | 1                 | 1              |                   | 6              |                   |                   | 1                   |
| 6         |              | 4                 | 1              | 2                 | 3              | 1                 | 7              |                   | 1                 |                     |
| 7         |              | 4                 | 3              | 1                 | 3              | 1                 | 9              |                   | 2                 |                     |
| 8         |              | 3                 | 2              | 2                 | 3              |                   | 10             |                   |                   |                     |
| 9         |              | 3                 | 1              | 2                 | 3              |                   | 11             |                   |                   |                     |
| 10        |              | 3                 | 1              | 2                 | 4              |                   | 11             |                   |                   |                     |
| 11        |              | 3                 | 3              |                   | 4              |                   | 11             |                   |                   |                     |

*Abstract of the Results of the Hourly Meteorological Observations  
taken at the Surveyor General's Office, Calcutta,  
in the month of April, 1859.*

Latitude 22° 33' 1" North. Longitude 88° 20' 34" East.

Feet.  
Height of the Cistern of the Standard Barometer above the Sea level, 18.11

Daily Means, &c. of the Observations and of the Hygrometrical elements  
dependent thereon.

| Date. | Mean Height of<br>the Barometer<br>at 32° Fahr. | Range of the Barometer<br>during the day. |         |         | Mean Dry Bulb<br>Thermometer. | Range of the Tempera-<br>ture during the day. |      |       |
|-------|-------------------------------------------------|-------------------------------------------|---------|---------|-------------------------------|-----------------------------------------------|------|-------|
|       |                                                 | Max.                                      | Min.    | Diff.   |                               | Max.                                          | Min. | Diff. |
|       | Inches.                                         | Inches.                                   | Inches. | Inches. | °                             | °                                             | °    | °     |
| 1     | 29.987                                          | 30.060                                    | 29.902  | 0.158   | 84.5                          | 92.8                                          | 76.6 | 16.2  |
| 2     | .956                                            | .027                                      | .867    | .160    | 84.9                          | 95.4                                          | 77.0 | 18.4  |
| 3     | Sunday.                                         |                                           |         |         |                               |                                               |      |       |
| 4     | .846                                            | 29.921                                    | .787    | .134    | 85.1                          | 96.4                                          | 78.4 | 18.0  |
| 5     | .837                                            | .894                                      | .762    | .132    | 85.1                          | 94.2                                          | 77.9 | 16.3  |
| 6     | .814                                            | .890                                      | .737    | .153    | 84.2                          | 92.8                                          | 76.6 | 16.2  |
| 7     | .802                                            | .874                                      | .722    | .152    | 85.1                          | 92.2                                          | 78.8 | 13.4  |
| 8     | .799                                            | .859                                      | .712    | .147    | 84.8                          | 92.6                                          | 79.2 | 13.4  |
| 9     | .814                                            | .879                                      | .741    | .138    | 81.7                          | 90.6                                          | 74.2 | 16.4  |
| 10    | Sunday.                                         |                                           |         |         |                               |                                               |      |       |
| 11    | .868                                            | .965                                      | .799    | .166    | 78.7                          | 87.0                                          | 68.9 | 18.1  |
| 12    | .833                                            | .922                                      | .739    | .183    | 79.2                          | 89.6                                          | 74.0 | 15.6  |
| 13    | .816                                            | .886                                      | .752    | .134    | 80.9                          | 90.4                                          | 73.0 | 17.4  |
| 14    | .822                                            | .909                                      | .745    | .164    | 81.8                          | 92.6                                          | 74.6 | 18.0  |
| 15    | .848                                            | .926                                      | .778    | .148    | 81.2                          | 90.2                                          | 73.6 | 16.6  |
| 16    | .827                                            | .902                                      | .758    | .144    | 84.8                          | 94.8                                          | 76.2 | 18.6  |
| 17    | Sunday.                                         |                                           |         |         |                               |                                               |      |       |
| 18    | .746                                            | .840                                      | .683    | .157    | 83.4                          | 91.8                                          | 76.2 | 15.6  |
| 19    | .762                                            | .836                                      | .697    | .139    | 84.9                          | 94.0                                          | 78.8 | 15.2  |
| 20    | .759                                            | .816                                      | .686    | .130    | 86.3                          | 95.4                                          | 79.8 | 15.6  |
| 21    | .740                                            | .812                                      | .658    | .154    | 87.2                          | 96.4                                          | 79.8 | 16.6  |
| 22    | .724                                            | .794                                      | .647    | .147    | 87.2                          | 98.0                                          | 79.5 | 18.5  |
| 23    | .731                                            | .797                                      | .666    | .131    | 86.4                          | 96.0                                          | 79.2 | 16.8  |
| 24    | Sunday.                                         |                                           |         |         |                               |                                               |      |       |
| 25    | .715                                            | .790                                      | .632    | .158    | 86.6                          | 93.8                                          | 80.8 | 13.0  |
| 26    | .754                                            | .806                                      | .672    | .134    | 85.5                          | 92.8                                          | 76.4 | 16.4  |
| 27    | .795                                            | .870                                      | .725    | .145    | 85.7                          | 94.4                                          | 75.6 | 18.8  |
| 28    | .830                                            | .892                                      | .748    | .144    | 86.3                          | 95.8                                          | 80.1 | 15.7  |
| 29    | .809                                            | .890                                      | .716    | .174    | 87.1                          | 95.6                                          | 79.6 | 16.0  |
| 30    | .795                                            | .878                                      | .701    | .177    | 88.2                          | 97.2                                          | 79.9 | 17.3  |

The Mean height of the Barometer, as likewise the Mean Dry and Wet Bulb Thermometers are derived from the twenty-four hourly observations made during he day.

*Abstract of the Results of the Hourly Meteorological Observations  
taken at the Surveyor General's Office, Calcutta,  
in the month of April, 1859.*

Daily Means, &c. of the Observations and of the Hygrometrical elements  
dependent thereon.—(Continued.)

| Date. | Mean Wet Bulb Ther-<br>mometer. | Dry Bulb above Wet. | Computed Dew Point. | Dry Bulb above Dew<br>Point. | Mean Elastic force of<br>Vapour. | Mean Weight of Vapour<br>in a cubic foot of air. | Additional Weight of Va-<br>pour required for com-<br>plete saturation. | Mean degree of Humi-<br>dity, complete satura-<br>tion being unity. |
|-------|---------------------------------|---------------------|---------------------|------------------------------|----------------------------------|--------------------------------------------------|-------------------------------------------------------------------------|---------------------------------------------------------------------|
|       | °                               | °                   | °                   | °                            | Inches.                          | T. gr.                                           | T. gr.                                                                  |                                                                     |
| 1     | 73.2                            | 11.3                | 67.5                | 17.0                         | 0.670                            | 7.17                                             | 5.18                                                                    | 0.58                                                                |
| 2     | 74.1                            | 10.8                | 68.7                | 16.2                         | .697                             | .44                                              | .05                                                                     | .60                                                                 |
| 3     | <i>Sunday.</i>                  |                     |                     |                              |                                  |                                                  |                                                                         |                                                                     |
| 4     | 74.9                            | 10.2                | 69.8                | 15.3                         | .722                             | .71                                              | 4.86                                                                    | .61                                                                 |
| 5     | 76.0                            | 9.1                 | 71.4                | 13.7                         | .761                             | 8.12                                             | .45                                                                     | .65                                                                 |
| 6     | 77.5                            | 6.7                 | 74.1                | 10.1                         | .830                             | .89                                              | 3.35                                                                    | .73                                                                 |
| 7     | 79.7                            | 5.4                 | 77.0                | 8.1                          | .910                             | 9.73                                             | 2.84                                                                    | .77                                                                 |
| 8     | 78.8                            | 6.0                 | 75.8                | 9.0                          | .876                             | .37                                              | 3.09                                                                    | .75                                                                 |
| 9     | 75.4                            | 6.3                 | 72.2                | 9.5                          | .871                             | 8.38                                             | 2.99                                                                    | .74                                                                 |
| 10    | <i>Sunday.</i>                  |                     |                     |                              |                                  |                                                  |                                                                         |                                                                     |
| 11    | 72.8                            | 5.9                 | 69.8                | 8.9                          | .722                             | 7.81                                             | .60                                                                     | .75                                                                 |
| 12    | 72.6                            | 6.6                 | 69.3                | 9.9                          | .711                             | .67                                              | .89                                                                     | .73                                                                 |
| 13    | 73.5                            | 7.4                 | 69.8                | 11.1                         | .722                             | .78                                              | 3.32                                                                    | .70                                                                 |
| 14    | 76.2                            | 5.6                 | 73.4                | 8.4                          | .811                             | 8.73                                             | 2.67                                                                    | .77                                                                 |
| 15    | 75.1                            | 6.1                 | 72.0                | 9.2                          | .776                             | .35                                              | .86                                                                     | .75                                                                 |
| 16    | 78.1                            | 6.7                 | 74.7                | 10.1                         | .846                             | 9.05                                             | 3.41                                                                    | .73                                                                 |
| 17    | <i>Sunday.</i>                  |                     |                     |                              |                                  |                                                  |                                                                         |                                                                     |
| 18    | 74.7                            | 8.7                 | 70.3                | 13.1                         | .734                             | 7.87                                             | 4.09                                                                    | .66                                                                 |
| 19    | 78.2                            | 6.7                 | 74.8                | 10.1                         | .849                             | 9.07                                             | 3.42                                                                    | .73                                                                 |
| 20    | 78.6                            | 7.7                 | 74.7                | 11.6                         | .846                             | .01                                              | 4.01                                                                    | .69                                                                 |
| 21    | 77.2                            | 10.0                | 72.2                | 15.0                         | .781                             | 8.29                                             | 5.08                                                                    | .62                                                                 |
| 22    | 77.7                            | 9.5                 | 72.9                | 14.3                         | .797                             | .49                                              | 4.88                                                                    | .64                                                                 |
| 23    | 78.4                            | 8.0                 | 74.4                | 12.0                         | .838                             | .93                                              | .13                                                                     | .68                                                                 |
| 24    | <i>Sunday.</i>                  |                     |                     |                              |                                  |                                                  |                                                                         |                                                                     |
| 25    | 79.8                            | 6.8                 | 76.4                | 10.2                         | .893                             | 9.53                                             | 3.61                                                                    | .73                                                                 |
| 26    | 79.0                            | 6.5                 | 75.7                | 9.8                          | .873                             | .32                                              | .40                                                                     | .73                                                                 |
| 27    | 79.2                            | 6.5                 | 75.9                | 9.8                          | .879                             | .38                                              | .42                                                                     | .73                                                                 |
| 28    | 79.5                            | 6.8                 | 76.1                | 10.2                         | .885                             | .44                                              | .58                                                                     | .73                                                                 |
| 29    | 78.3                            | 8.8                 | 73.9                | 13.2                         | .824                             | 8.78                                             | 4.55                                                                    | .66                                                                 |
| 30    | 79.0                            | 9.2                 | 74.4                | 13.8                         | .838                             | .89                                              | .87                                                                     | .65                                                                 |

All the Hygrometrical elements are computed by the Greenwich Constants.

*Abstract of the Results of the Hourly Meteorological Observations  
taken at the Surveyor General's Office, Calcutta,  
in the month of April, 1859.*

Hourly Means, &c. of the Observations and of the Hygrometrical elements  
dependent thereon.

| Hour.          | Mean Height of<br>the Barometer<br>at 32° Fahr. | Range of the Barometer<br>for each hour during<br>the month. |         |         | Mean Dry Bulb<br>Thermometer. | Range of the Temperature<br>for each hour during<br>the month. |      |       |
|----------------|-------------------------------------------------|--------------------------------------------------------------|---------|---------|-------------------------------|----------------------------------------------------------------|------|-------|
|                |                                                 | Max.                                                         | Min.    | Diff.   |                               | Max.                                                           | Min. | Diff. |
|                | Inches.                                         | Inches.                                                      | Inches. | Inches. | o                             | o                                                              | o    | o     |
| Mid-<br>night. | 29.821                                          | 30.060                                                       | 29.714  | 0.346   | 79.9                          | 84.8                                                           | 73.8 | 11.0  |
| 1              | .806                                            | .048                                                         | .704    | .344    | 79.7                          | 83.8                                                           | 75.0 | 8.8   |
| 2              | .794                                            | .027                                                         | .696    | .331    | 79.2                          | 83.8                                                           | 74.8 | 9.0   |
| 3              | .786                                            | .009                                                         | .689    | .320    | 78.9                          | 82.4                                                           | 74.2 | 8.2   |
| 4              | .789                                            | 29.992                                                       | .700    | .292    | 78.4                          | 81.8                                                           | 71.7 | 10.1  |
| 5              | .805                                            | .982                                                         | .725    | .257    | 78.0                          | 82.1                                                           | 69.8 | 12.3  |
| 6              | .825                                            | 30.002                                                       | .744    | .258    | 77.8                          | 82.4                                                           | 68.9 | 13.5  |
| 7              | .846                                            | .020                                                         | .763    | .257    | 78.5                          | 83.0                                                           | 69.8 | 13.2  |
| 8              | .860                                            | .027                                                         | .774    | .253    | 81.4                          | 86.0                                                           | 72.5 | 13.5  |
| 9              | .877                                            | .054                                                         | .758    | .296    | 84.6                          | 88.2                                                           | 77.8 | 10.4  |
| 10             | .875                                            | .049                                                         | .759    | .290    | 87.3                          | 92.2                                                           | 80.8 | 11.4  |
| 11             | .865                                            | .037                                                         | .757    | .280    | 89.4                          | 93.2                                                           | 81.6 | 11.6  |
| Noon.          | .844                                            | .018                                                         | .732    | .286    | 91.5                          | 95.6                                                           | 85.2 | 10.4  |
| 1              | .816                                            | 29.981                                                       | .724    | .257    | 92.3                          | 96.0                                                           | 83.8 | 12.2  |
| 2              | .787                                            | .943                                                         | .701    | .242    | 93.0                          | 98.0                                                           | 82.8 | 15.2  |
| 3              | .759                                            | .921                                                         | .678    | .243    | 93.0                          | 97.8                                                           | 85.4 | 12.4  |
| 4              | .737                                            | .909                                                         | .647    | .262    | 92.4                          | 97.2                                                           | 87.0 | 10.2  |
| 5              | .737                                            | .907                                                         | .632    | .275    | 90.5                          | 95.4                                                           | 81.0 | 14.4  |
| 6              | .747                                            | .902                                                         | .641    | .261    | 87.9                          | 93.9                                                           | 77.0 | 16.9  |
| 7              | .766                                            | .936                                                         | .663    | .273    | 85.1                          | 90.8                                                           | 75.8 | 15.0  |
| 8              | .791                                            | .962                                                         | .682    | .280    | 83.7                          | 89.2                                                           | 74.6 | 14.6  |
| 9              | .823                                            | .987                                                         | .698    | .289    | 82.4                          | 87.2                                                           | 74.8 | 12.4  |
| 10             | .830                                            | 30.000                                                       | .719    | .281    | 81.4                          | 86.0                                                           | 74.8 | 11.2  |
| 11             | .826                                            | 29.979                                                       | .726    | .253    | 80.8                          | 85.2                                                           | 75.0 | 10.2  |

The Mean Height of the Barometer, as likewise the Mean Dry and Wet Bulb Thermometers are derived from the observations made at the several hours during the month.

*Abstract of the Results of the Hourly Meteorological Observations  
taken at the Surveyor General's Office, Calcutta,  
in the month of April, 1859.*

Hourly Means, &c. of the Observations and of the Hygrometrical elements  
dependent thereon.—(Continued.)

| Hour.          | Mean Wet Bulb<br>Thermometer. | Dry Bulb above Wet. | Computed Dew point. | Dry Bulb above Dew<br>point. | Mean elastic force of<br>Vapour. | Mean Weight of Va-<br>pour in a Cubic foot<br>of Air. | Additional weight of<br>vapour required for<br>complete saturation. | Mean degree of hu-<br>midity, complete satu-<br>ration being unity. |
|----------------|-------------------------------|---------------------|---------------------|------------------------------|----------------------------------|-------------------------------------------------------|---------------------------------------------------------------------|---------------------------------------------------------------------|
|                | o                             | o                   | o                   | o                            | Inches.                          | Troy grs.                                             | Troy grs.                                                           |                                                                     |
| Mid-<br>night. | 75.6                          | 4.3                 | 73.4                | 6.5                          | 0.811                            | 8.75                                                  | 2.03                                                                | 0.81                                                                |
| 1              | 75.5                          | 4.2                 | 73.4                | 6.3                          | .811                             | .76                                                   | 1.96                                                                | .82                                                                 |
| 2              | 74.9                          | 4.3                 | 72.7                | 6.5                          | .792                             | .56                                                   | 2.00                                                                | .81                                                                 |
| 3              | 74.9                          | 4.0                 | 72.9                | 6.0                          | .797                             | .63                                                   | 1.84                                                                | .82                                                                 |
| 4              | 74.6                          | 3.8                 | 72.7                | 5.7                          | .792                             | .58                                                   | .73                                                                 | .83                                                                 |
| 5              | 74.4                          | 3.6                 | 72.6                | 5.4                          | .790                             | .57                                                   | .62                                                                 | .84                                                                 |
| 6              | 74.4                          | 3.4                 | 72.7                | 5.1                          | .792                             | .59                                                   | .54                                                                 | .85                                                                 |
| 7              | 74.9                          | 3.6                 | 73.1                | 5.4                          | .803                             | .70                                                   | .65                                                                 | .84                                                                 |
| 8              | 76.5                          | 4.9                 | 74.0                | 7.4                          | .827                             | .91                                                   | 2.36                                                                | .79                                                                 |
| 9              | 77.4                          | 7.2                 | 73.8                | 10.8                         | .822                             | .78                                                   | 3.61                                                                | .71                                                                 |
| 10             | 78.1                          | 9.2                 | 73.5                | 13.8                         | .814                             | .65                                                   | 4.76                                                                | .65                                                                 |
| 11             | 78.7                          | 10.7                | 73.3                | 16.1                         | .809                             | .56                                                   | 5.69                                                                | .60                                                                 |
| Noon.          | 79.2                          | 12.3                | 73.0                | 18.5                         | .801                             | .43                                                   | 6.72                                                                | .56                                                                 |
| 1              | 79.6                          | 12.7                | 73.2                | 19.1                         | .806                             | .48                                                   | 7.02                                                                | .55                                                                 |
| 2              | 79.5                          | 13.5                | 72.7                | 20.3                         | .792                             | .33                                                   | .48                                                                 | .53                                                                 |
| 3              | 78.9                          | 14.1                | 71.8                | 21.2                         | .771                             | .10                                                   | .71                                                                 | .51                                                                 |
| 4              | 78.8                          | 13.6                | 72.0                | 20.4                         | .776                             | .16                                                   | .38                                                                 | .53                                                                 |
| 5              | 78.1                          | 12.4                | 71.9                | 18.6                         | .773                             | .16                                                   | 6.56                                                                | .55                                                                 |
| 6              | 77.8                          | 10.1                | 72.7                | 15.2                         | .792                             | .42                                                   | 5.22                                                                | .62                                                                 |
| 7              | 77.1                          | 8.0                 | 73.1                | 12.0                         | .803                             | .58                                                   | 3.99                                                                | .68                                                                 |
| 8              | 76.5                          | 7.2                 | 72.9                | 10.8                         | .797                             | .54                                                   | .53                                                                 | .71                                                                 |
| 9              | 76.3                          | 6.1                 | 73.2                | 9.2                          | .806                             | .66                                                   | 2.95                                                                | .75                                                                 |
| 10             | 76.1                          | 5.3                 | 73.4                | 8.0                          | .811                             | .73                                                   | .54                                                                 | .78                                                                 |
| 11             | 76.1                          | 4.7                 | 73.7                | 7.1                          | .819                             | .83                                                   | .24                                                                 | .80                                                                 |

All the Hygrometrical elements are computed by the Greenwich Constants.



*Abstract of the Results of the Hourly Meteorological Observations  
taken at the Surveyor General's Office, Calcutta,  
in the month of April, 1859.*

Solar Radiation, Weather, &c.

| Date. | Max. Solar radiation. | Rain Gauge 5 feet above Ground. | Prevailing direction of the Wind. | General Aspect of the Sky.                                                                        |
|-------|-----------------------|---------------------------------|-----------------------------------|---------------------------------------------------------------------------------------------------|
|       | o                     | Inches.                         |                                   |                                                                                                   |
| 1     | 126.0                 | ..                              | S. & E. & N.                      | Cloudy till 7 P. M. cloudless afterwards.                                                         |
| 2     | 147.0                 | ..                              | S. & S. W.                        | Cloudless till 11 A. M. Scatd. \i afterwards.                                                     |
| 3     | <i>Sunday.</i>        |                                 |                                   |                                                                                                   |
| 4     | 136.4                 | ..                              | S. & S. W.                        | Scatd. \i or \i till 7 P. M.; cloudless afterwards.                                               |
| 5     | 130.4                 | ..                              | S.                                | Scatd. clouds till 8 A. M. Scatd. \i till 5 P. M. cloudy afterwards.                              |
| 6     | 131.0                 | ..                              | S.                                | Scatd. clouds till 11 A. M.; cloudless afterwards.                                                |
| 7     | 127.5                 | ..                              | S.                                | Scatd. \i and \i till 9 A. M. cloudless till 1 P. M. Scatd. \i till 7 P. M. cloudless afterwards. |
| 8     | 131.0                 | ..                              | S. & S. E.                        | Nearly cloudless till 11 A. M.; clouds of various kinds afterwards.                               |
| 9     | 119.0                 | ..                              | S. & E.                           | Cloudless till 9 A. M. Scatd. \i or \i afterwards.                                                |
| 10    | <i>Sunday.</i>        | 0.97                            |                                   |                                                                                                   |
| 11    | 127.0                 | ..                              | S. E. & E.                        | Scatd. \i.                                                                                        |
| 12    | 126.0                 | ..                              | Variable.                         | Scatd. clouds.                                                                                    |
| 13    | 130.6                 | ..                              | S.                                | Cloudless till 7 A. M. Scatd. \i till 5 P. M. cloudless afterwards.                               |
| 14    | 131.5                 | 0.17                            | S.                                | Scatd. clouds; also slightly raining between 7 and 8 P. M.                                        |
| 15    | 130.5                 | ..                              | Variable.                         | Nearly cloudless.                                                                                 |
| 16    | 142.0                 | ..                              | S. & S. E.                        | Cloudless till Noon. Scatd. \i till 8 P. M. cloudless afterwards.                                 |
| 17    | <i>Sunday.</i>        |                                 |                                   |                                                                                                   |
| 18    | 140.5                 | ..                              | W. & N.                           | Scatd. \i and \i till 6 P. M. cloudless afterwards.                                               |
| 19    | 143.0                 | ..                              | S.                                | Scatd. \i and \i.                                                                                 |
| 20    | 146.5                 | ..                              | S.                                | Cloudless till 7 A. M. Scatd. \i till 7 P. M. cloudless afterwards.                               |
| 21    | 136.0                 | ..                              | S. W. & S.                        | Scatd. clouds till 7 A. M. cloudless afterwards.                                                  |
| 22    | 134.0                 | ..                              | S.                                | Cloudless.                                                                                        |

\i Cirri, \i cirro strati, \i cumuli, \i cumulo strati, \i nimbi, —i strati, \i cirro cumuli.

*Abstract of the Results of the Hourly Meteorological Observations  
taken at the Surveyor General's Office, Calcutta,  
in the month of April, 1859.*

Solar Radiation, Weather, &c.

| Date. | Max. Solar radiation. | Rain Gauge 5 feet above Ground. | Prevailing direction of the Wind. | General Aspect of the Sky.                                                                                               |
|-------|-----------------------|---------------------------------|-----------------------------------|--------------------------------------------------------------------------------------------------------------------------|
|       | o                     | Inches.                         |                                   |                                                                                                                          |
| 23    | 138.0                 | ..                              | S. & W.                           | Cloudless till 11 A. M. Scatd. \i till 4 P. M. cloudless afterwards.                                                     |
| 24    | <i>Sunday.</i>        |                                 |                                   |                                                                                                                          |
| 25    | 128.0                 | ..                              | S. & S. E.                        | Scatd. \i till 5 A. M. cloudless afterwards.                                                                             |
| 26    | 124.0                 | 0.15                            | S.                                | Cloudless till 8 A. M. Scatd. \i till 2 P. M. cloudy afterwards; also rain with thunder and lightning from 9 to 10 P. M. |
| 27    | 135.0                 | ..                              | S.                                | Scatd. clouds of all kinds.                                                                                              |
| 28    | 139 0                 | ..                              | S. & S. E. & W.                   | Scatd. \i till 11 A. M. cloudy afterwards; also slightly drizzling at 5 P. M.                                            |
| 29    | 144.0                 | ..                              | W. & S.                           | Cloudy nearly the whole day.                                                                                             |
| 30    | 144.5                 | ..                              | S. & S. W.                        | Scatd. clouds.                                                                                                           |

*Abstract of the Results of the Hourly Meteorological Observations  
taken at the Surveyor General's Office, Calcutta,  
in the month of April, 1859.*

MONTHLY RESULTS.

|                                                                |    |    | Inches. |
|----------------------------------------------------------------|----|----|---------|
| Mean height of the Barometer for the month,                    | .. | .. | 29.809  |
| Max. height of the Barometer, occurred at midnight on the 1st, | .. | .. | 30.060  |
| Min. height of the Barometer, occurred at 5 P. M. on the 25th, | .. | .. | 29.632  |
| <i>Extreme Range</i> of the Barometer during the month,        | .. | .. | 0.428   |
| Mean of the Daily Max. Pressures,                              | .. | .. | 29.882  |
| Ditto ditto Min. ditto,                                        | .. | .. | 29.732  |
| <i>Mean Daily range</i> of the Barometer during the month,     | .. | .. | 0.150   |

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|                                                                |    |    | o    |
|----------------------------------------------------------------|----|----|------|
| Mean Dry Bulb Thermometer for the month,                       | .. | .. | 84.5 |
| Max. Temperature, occurred at 2 P. M. on the 22nd,             | .. | .. | 98.0 |
| Min. Temperature occurred at 6 A. M. on the 11th,              | .. | .. | 68.9 |
| <i>Extreme Range</i> of the Temperature during the month,      | .. | .. | 29.1 |
| Mean of the Daily Max. Temperature,                            | .. | .. | 93.6 |
| Ditto ditto Min. ditto,                                        | .. | .. | 77.1 |
| <i>Mean Daily range</i> of the Temperature during the month,.. | .. | .. | 16.5 |

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|                                                            |    |    | o       |
|------------------------------------------------------------|----|----|---------|
| Mean Wet Bulb Thermometer for the month,                   | .. | .. | 76.8    |
| Mean Dry Bulb Thermometer above Mean Wet Bulb Thermometer, | .. | .. | 7.7     |
| Computed Mean Dew Point for the month,                     | .. | .. | 72.9    |
| Mean Dry Bulb Thermometer above computed Mean Dew Point,   | .. | .. | 11.6    |
|                                                            |    |    | Inches. |
| Mean Elastic force of vapour for the month,                | .. | .. | 0.797   |

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|                                                                         |    |    | Troy grains. |
|-------------------------------------------------------------------------|----|----|--------------|
| Mean weight of vapour for the month,                                    | .. | .. | 8.52         |
| Additional weight of vapour required for complete saturation,           | .. | .. | 3.83         |
| Mean degree of Humidity for the month, complete saturation being unity, | .. | .. | 0.69         |

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|                                                   |    |    | Inches.            |
|---------------------------------------------------|----|----|--------------------|
| Rained 4 days.—Max. fall of rain during 24 hours, | .. | .. | 0.97               |
| Total amount of rain during the month,            | .. | .. | 1.29               |
| Prevailing direction of the Wind, .               | .. | .. | S. & S. E. & S. W. |

*Abstract of the Results of the Hourly Meteorological Observations  
taken at the Surveyor General's Office, Calcutta,  
in the month of April, 1859.*

## MONTHLY RESULTS.

Table showing the number of days on which at a given hour any particular wind  
blew, together with the number of days on which at the same hour,  
when any particular wind was blowing, it rained.

| Hour.     | N.           | Rain on. | N. E. | Rain on. | E. | Rain on. | S. E. | Rain on. | S. | Rain on. | S. W. | Rain on. | W. | Rain on. | N. W. | Rain on. | Calm. | Rain on. | Missed. |
|-----------|--------------|----------|-------|----------|----|----------|-------|----------|----|----------|-------|----------|----|----------|-------|----------|-------|----------|---------|
|           | No. of days. |          |       |          |    |          |       |          |    |          |       |          |    |          |       |          |       |          |         |
| Midnight. |              |          |       |          | 2  |          | 5     |          | 17 |          |       |          |    |          |       |          | 1     |          | 1       |
| 1         |              |          | 1     |          | 1  |          | 5     |          | 19 |          |       |          |    |          |       |          |       |          |         |
| 2         |              |          | 1     |          | 1  |          | 2     |          | 19 |          |       |          | 1  |          |       |          |       |          | 2       |
| 3         |              |          |       |          | 2  |          | 5     |          | 14 |          | 1     |          | 2  |          |       |          |       |          | 2       |
| 4         |              |          |       |          | 2  |          | 5     |          | 15 |          | 2     |          | 2  |          |       |          |       |          |         |
| 5         | 1            |          | 2     |          | 3  |          | 3     |          | 12 |          | 3     |          | 1  |          | 1     |          |       |          |         |
| 6         | 3            |          | 2     |          | 2  |          | 2     |          | 13 |          | 3     |          | 1  |          |       |          |       |          |         |
| 7         | 2            |          | 2     |          | 3  |          | 2     |          | 13 |          | 1     |          | 3  |          |       |          |       |          |         |
| 8         | 3            |          | 1     |          |    |          | 1     |          | 12 |          | 5     |          | 3  |          |       |          |       |          | 1       |
| 9         | 3            |          |       |          | 2  |          | 1     |          | 13 |          | 5     |          | 2  |          |       |          |       |          |         |
| 10        | 2            |          | 1     |          | 1  |          | 1     |          | 13 |          | 6     |          | 2  |          |       |          |       |          |         |
| 11        | 2            |          |       |          | 2  |          | 4     |          | 12 |          | 4     |          | 2  |          |       |          |       |          |         |
| Noon.     | 1            |          |       |          | 2  |          | 2     |          | 12 |          | 3     |          | 6  |          |       |          |       |          |         |
| 1         | 2            |          |       |          | 1  |          | 1     |          | 13 |          | 5     |          | 3  |          | 1     |          |       |          |         |
| 2         |              |          |       |          | 1  |          | 2     |          | 12 |          | 4     |          | 6  |          |       |          |       |          | 1       |
| 3         | 1            |          | 1     |          |    |          | 1     |          | 12 |          | 5     |          | 6  |          |       |          |       |          |         |
| 4         | 1            |          | 1     |          | 2  |          | 1     |          | 15 |          | 2     |          | 3  |          | 1     |          |       |          |         |
| 5         |              |          |       |          | 3  |          | 2     |          | 16 | 1        | 2     |          | 2  |          | 1     |          |       |          |         |
| 6         |              |          | 1     |          | 2  |          | 3     |          | 13 |          | 5     |          | 1  |          | 1     |          |       |          |         |
| 7         | 1            |          | 2     | 1        | 2  |          | 1     |          | 16 |          | 4     |          |    |          |       |          |       |          |         |
| 8         | 1            |          | 1     | 1        |    |          | 5     |          | 16 |          | 2     |          |    |          |       |          | 1     |          |         |
| 9         | 2            |          |       |          | 1  |          | 5     |          | 16 |          | 1     |          | 1  |          |       |          |       |          |         |
| 10        | 1            |          |       |          | 1  |          | 5     |          | 17 | 1        | 1     |          |    |          |       |          | 1     |          |         |
| 11        | 1            |          |       |          | 1  |          | 4     |          | 18 |          | 1     |          |    |          |       |          |       |          | 1       |

*Abstract of the Results of the Hourly Meteorological Observations  
taken at the Surveyor General's Office, Calcutta,  
in the month of May, 1859.*

Latitude 22° 33' 1" North. Longitude 88° 20' 34" East.

Feet.  
Height of the Cistern of the Standard Barometer above the Sea level, 18.11

Daily Means, &c. of the Observations and of the Hygrometrical elements  
dependent thereon.

| Date. | Mean Height of<br>the Barometer<br>at 32° Fahr. | Range of the Barometer<br>during the day. |         |         | Mean Dry Bulb<br>Thermometer. | Range of the Tempera-<br>ture during the day. |      |       |
|-------|-------------------------------------------------|-------------------------------------------|---------|---------|-------------------------------|-----------------------------------------------|------|-------|
|       |                                                 | Max.                                      | Min.    | Diff.   |                               | Max.                                          | Min. | Diff. |
|       | Inches.                                         | Inches.                                   | Inches. | Inches. | o                             | o                                             | o    | o     |
| 1     | <i>Sunday.</i>                                  |                                           |         |         |                               |                                               |      |       |
| 2     | 29.798                                          | 29.859                                    | 29.717  | 0.142   | 85.0                          | 94.2                                          | 77.4 | 16.8  |
| 3     | .773                                            | .841                                      | .674    | .167    | 87.1                          | 97.0                                          | 79.6 | 17.4  |
| 4     | .778                                            | .905                                      | .652    | .253    | 85.5                          | 97.3                                          | 72.6 | 24.7  |
| 5     | .791                                            | .878                                      | .708    | .170    | 78.9                          | 91.4                                          | 72.0 | 19.4  |
| 6     | .775                                            | .872                                      | .696    | .176    | 82.9                          | 91.0                                          | 73.4 | 17.6  |
| 7     | .739                                            | .786                                      | .671    | .115    | 81.6                          | 93.9                                          | 75.1 | 18.8  |
| 8     | <i>Sunday.</i>                                  |                                           |         |         |                               |                                               |      |       |
| 9     | .769                                            | .838                                      | .701    | .137    | 85.3                          | 93.0                                          | 78.6 | 14.4  |
| 10    | .747                                            | .830                                      | .660    | .170    | 87.0                          | 95.6                                          | 80.0 | 15.6  |
| 11    | .689                                            | .761                                      | .563    | .198    | 88.1                          | 98.2                                          | 81.2 | 17.0  |
| 12    | .685                                            | .731                                      | .588    | .143    | 86.7                          | 96.4                                          | 80.0 | 16.4  |
| 13    | .674                                            | .730                                      | .594    | .136    | 89.0                          | 99.4                                          | 80.6 | 18.8  |
| 14    | .686                                            | .742                                      | .602    | .140    | 87.9                          | 98.6                                          | 81.2 | 17.4  |
| 15    | <i>Sunday.</i>                                  |                                           |         |         |                               |                                               |      |       |
| 16    | .689                                            | .755                                      | .606    | .149    | 87.6                          | 98.6                                          | 78.6 | 20.0  |
| 17    | .691                                            | .749                                      | .618    | .131    | 87.5                          | 98.4                                          | 80.4 | 18.0  |
| 18    | .752                                            | .824                                      | .679    | .145    | 85.8                          | 95.0                                          | 76.2 | 18.8  |
| 19    | .649                                            | .715                                      | .554    | .161    | 88.5                          | 95.3                                          | 83.2 | 12.1  |
| 20    | .597                                            | .660                                      | .500    | .160    | 88.4                          | 95.8                                          | 81.7 | 14.1  |
| 21    | .627                                            | .678                                      | .527    | .151    | 87.1                          | 97.5                                          | 79.5 | 18.0  |
| 22    | <i>Sunday.</i>                                  |                                           |         |         |                               |                                               |      |       |
| 23    | .651                                            | .707                                      | .579    | .128    | 88.9                          | 96.8                                          | 83.0 | 13.8  |
| 24    | .667                                            | .710                                      | .590    | .120    | 87.3                          | 93.6                                          | 77.4 | 16.2  |
| 25    | .672                                            | .722                                      | .557    | .165    | 84.8                          | 95.4                                          | 76.0 | 19.4  |
| 26    | .661                                            | .730                                      | .590    | .140    | 86.0                          | 93.8                                          | 77.6 | 16.2  |
| 27    | .692                                            | .781                                      | .629    | .152    | 85.9                          | 93.2                                          | 77.4 | 15.8  |
| 28    | .677                                            | .750                                      | .580    | .170    | 85.3                          | 94.4                                          | 76.2 | 18.2  |
| 29    | <i>Sunday.</i>                                  |                                           |         |         |                               |                                               |      |       |
| 30    | .602                                            | .674                                      | .506    | .168    | 88.4                          | 97.8                                          | 82.2 | 15.6  |
| 31    | .640                                            | .709                                      | .569    | .140    | 82.6                          | 90.5                                          | 78.0 | 12.5  |

The Mean height of the Barometer, as likewise the Mean Dry and Wet Bulb Thermometers are derived from the twenty-four hourly observations made during the day.

*Abstract of the Results of the Hourly Meteorological Observations  
taken at the Surveyor General's Office, Calcutta,  
in the month of May, 1859.*

Daily Means, &c. of the Observations and of the Hygrometrical elements  
dependent thereon.—(Continued.)

| Date. | Mean Wet Bulb Ther-<br>mometer. | Dry Bulb above Wet. | Computed Dew Point. | Dry<br>Bulb above Dew<br>Point. | Mean Elastic force of<br>Vapour. | Mean Weight of Vapour<br>in a cubic foot of air. | Additional Weight of Va-<br>pour required for com-<br>plete saturation. | Mean degree of Humi-<br>dity, complete satura-<br>tion being unity. |
|-------|---------------------------------|---------------------|---------------------|---------------------------------|----------------------------------|--------------------------------------------------|-------------------------------------------------------------------------|---------------------------------------------------------------------|
| 1     | <i>Sunday.</i>                  | o                   | o                   | o                               | Inches.                          | T. gr.                                           | T. gr.                                                                  |                                                                     |
| 2     | 75.7                            | 9.3                 | 71.0                | 14.0                            | 0.751                            | 8.02                                             | 4.51                                                                    | 0.64                                                                |
| 3     | 78.6                            | 8.5                 | 74.3                | 12.8                            | .835                             | .88                                              | .45                                                                     | .67                                                                 |
| 4     | 76.7                            | 8.8                 | 72.3                | 13.2                            | .783                             | .36                                              | .36                                                                     | .66                                                                 |
| 5     | 73.4                            | 5.5                 | 70.6                | 8.3                             | .741                             | .02                                              | 2.45                                                                    | .77                                                                 |
| 6     | 75.9                            | 7.0                 | 72.4                | 10.5                            | .785                             | .41                                              | 3.38                                                                    | .71                                                                 |
| 7     | 75.7                            | 5.9                 | 72.7                | 8.9                             | .792                             | .52                                              | 2.82                                                                    | .75                                                                 |
| 8     | <i>Sunday.</i>                  |                     |                     |                                 |                                  |                                                  |                                                                         |                                                                     |
| 9     | 79.3                            | 6.0                 | 76.3                | 9.0                             | .890                             | 9.52                                             | 3.12                                                                    | .75                                                                 |
| 10    | 80.1                            | 6.9                 | 76.6                | 10.4                            | .899                             | .57                                              | .72                                                                     | .72                                                                 |
| 11    | 80.2                            | 7.9                 | 76.2                | 11.9                            | .887                             | .43                                              | 4.29                                                                    | .69                                                                 |
| 12    | 78.5                            | 8.2                 | 74.4                | 12.3                            | .838                             | 8.93                                             | .25                                                                     | .68                                                                 |
| 13    | 80.0                            | 9.0                 | 75.5                | 13.5                            | .868                             | 9.20                                             | .88                                                                     | .65                                                                 |
| 14    | 79.6                            | 8.3                 | 75.4                | 12.5                            | .865                             | .18                                              | .46                                                                     | .67                                                                 |
| 15    | <i>Sunday.</i>                  |                     |                     |                                 |                                  |                                                  |                                                                         |                                                                     |
| 16    | 79.3                            | 8.3                 | 75.1                | 12.5                            | .857                             | .10                                              | .42                                                                     | .67                                                                 |
| 17    | 79.3                            | 8.2                 | 75.2                | 12.3                            | .860                             | .15                                              | .34                                                                     | .68                                                                 |
| 18    | 78.8                            | 7.0                 | 75.3                | 10.5                            | .862                             | .19                                              | 3.64                                                                    | .72                                                                 |
| 19    | 82.9                            | 5.6                 | 80.1                | 8.4                             | 1.005                            | 10.67                                            | .21                                                                     | .77                                                                 |
| 20    | 81.6                            | 6.8                 | 78.2                | 10.2                            | 0.946                            | .05                                              | .79                                                                     | .73                                                                 |
| 21    | 79.8                            | 7.3                 | 76.1                | 11.0                            | .885                             | 9.42                                             | .91                                                                     | .71                                                                 |
| 22    | <i>Sunday.</i>                  |                     |                     |                                 |                                  |                                                  |                                                                         |                                                                     |
| 23    | 82.9                            | 6.0                 | 79.9                | 9.0                             | .998                             | 10.59                                            | .45                                                                     | .75                                                                 |
| 24    | 81.4                            | 5.9                 | 78.4                | 8.9                             | .952                             | .12                                              | .29                                                                     | .76                                                                 |
| 25    | 78.6                            | 6.2                 | 75.5                | 9.3                             | .868                             | 9.29                                             | .17                                                                     | .75                                                                 |
| 26    | 80.3                            | 5.7                 | 77.4                | 8.6                             | .922                             | .83                                              | .08                                                                     | .76                                                                 |
| 27    | 80.8                            | 5.1                 | 78.2                | 7.7                             | .946                             | 10.09                                            | 2.78                                                                    | .78                                                                 |
| 28    | 80.1                            | 5.2                 | 77.5                | 7.8                             | .925                             | 9.88                                             | .76                                                                     | .78                                                                 |
| 29    | <i>Sunday.</i>                  |                     |                     |                                 |                                  |                                                  |                                                                         |                                                                     |
| 30    | 81.9                            | 6.5                 | 78.6                | 9.8                             | .958                             | 10.17                                            | 3.67                                                                    | .74                                                                 |
| 31    | 78.0                            | 4.6                 | 75.7                | 6.9                             | .873                             | 9.38                                             | 2.30                                                                    | .80                                                                 |

All the Hygrometrical elements are computed by the Greenwich Constants.

*Abstract of the Results of the Hourly Meteorological Observations  
taken at the Surveyor General's Office, Calcutta,  
in the month of May, 1859.*

Hourly Means, &c. of the Observations and of the Hygrometrical elements  
dependent thereon.

| Hour.          | Mean Height of<br>the Barometer<br>at 32° Fahr. | Range of the Barometer<br>for each hour during<br>the month. |         |         | Mean Dry Bulb<br>Thermometer. | Range of the Temperature<br>for each hour during<br>the month. |      |       |
|----------------|-------------------------------------------------|--------------------------------------------------------------|---------|---------|-------------------------------|----------------------------------------------------------------|------|-------|
|                |                                                 | Max.                                                         | Min.    | Diff.   |                               | Max.                                                           | Min. | Diff. |
|                | Inches.                                         | Inches.                                                      | Inches. | Inches. | °                             | °                                                              | °    | °     |
| Mid-<br>night. | 29.714                                          | 29.852                                                       | 29.607  | 0.245   | 81.7                          | 85.6                                                           | 72.8 | 12.8  |
| 1              | .702                                            | .827                                                         | .590    | .237    | 81.4                          | 85.1                                                           | 72.8 | 12.3  |
| 2              | .691                                            | .805                                                         | .579    | .226    | 80.9                          | 85.5                                                           | 72.0 | 13.5  |
| 3              | .682                                            | .805                                                         | .562    | .243    | 80.8                          | 84.8                                                           | 72.4 | 12.4  |
| 4              | .689                                            | .797                                                         | .571    | .226    | 80.1                          | 84.7                                                           | 72.4 | 12.3  |
| 5              | .705                                            | .808                                                         | .593    | .215    | 79.8                          | 84.6                                                           | 72.6 | 12.0  |
| 6              | .719                                            | .812                                                         | .615    | .197    | 79.9                          | 84.8                                                           | 73.0 | 11.8  |
| 7              | .736                                            | .837                                                         | .634    | .203    | 81.1                          | 85.8                                                           | 74.4 | 11.4  |
| 8              | .749                                            | .870                                                         | .644    | .226    | 85.1                          | 88.6                                                           | 79.2 | 9.4   |
| 9              | .758                                            | .878                                                         | .660    | .218    | 87.5                          | 90.6                                                           | 81.6 | 9.0   |
| 10             | .756                                            | .872                                                         | .655    | .217    | 89.9                          | 94.1                                                           | 83.2 | 10.9  |
| 11             | .743                                            | .856                                                         | .641    | .215    | 92.0                          | 95.2                                                           | 84.2 | 11.0  |
| Noon.          | .727                                            | .825                                                         | .626    | .199    | 93.3                          | 96.7                                                           | 85.4 | 11.3  |
| 1              | .698                                            | .795                                                         | .603    | .192    | 94.3                          | 98.4                                                           | 86.9 | 11.5  |
| 2              | .668                                            | .771                                                         | .559    | .212    | 94.7                          | 99.2                                                           | 84.2 | 15.0  |
| 3              | .642                                            | .742                                                         | .525    | .217    | 94.3                          | 99.4                                                           | 83.3 | 16.1  |
| 4              | .623                                            | .761                                                         | .500    | .261    | 93.3                          | 98.6                                                           | 76.2 | 22.4  |
| 5              | .618                                            | .717                                                         | .506    | .211    | 91.1                          | 96.2                                                           | 75.2 | 21.0  |
| 6              | .640                                            | .728                                                         | .526    | .202    | 88.7                          | 94.0                                                           | 75.1 | 18.9  |
| 7              | .665                                            | .746                                                         | .553    | .193    | 85.8                          | 90.2                                                           | 76.8 | 13.4  |
| 8              | .691                                            | .803                                                         | .582    | .221    | 84.3                          | 88.0                                                           | 76.4 | 11.6  |
| 9              | .711                                            | .905                                                         | .617    | .288    | 82.7                          | 87.4                                                           | 72.6 | 14.8  |
| 10             | .720                                            | .863                                                         | .630    | .233    | 82.2                          | 87.4                                                           | 73.6 | 13.8  |
| 11             | .717                                            | .836                                                         | .631    | .205    | 81.7                          | 86.4                                                           | 73.0 | 13.4  |

The Mean Height of the Barometer, as likewise the Mean Dry and Wet Bulb Thermometers are derived from the observations made at the several hours during the month.

*Abstract of the Result of the Hourly Meteorological Observations  
taken at the Surveyor General's Office, Calcutta,  
in the month of May, 1859.*

Hourly Means, &c. of the Observations and of the Hygrometrical elements  
dependent thereon.—(Continued.)

| Hour.          | Mean Wet Bulb<br>Thermometer. | Dry Bulb above Wet. | Computed Dew point. | Dry Bulb above Dew<br>point. | Mean elastic force of<br>Vapour. | Mean Weight of Va-<br>pour in a Cubic foot<br>of Air. | Additional weight of<br>vapour required for<br>complete saturation. | Mean degree of hu-<br>midity, complete satu-<br>ration being unity. |
|----------------|-------------------------------|---------------------|---------------------|------------------------------|----------------------------------|-------------------------------------------------------|---------------------------------------------------------------------|---------------------------------------------------------------------|
|                | o                             | o                   | o                   | o                            | Inches.                          | Troy grs.                                             | Troy grs.                                                           |                                                                     |
| Mid-<br>night. | 77.4                          | 4.3                 | 75.2                | 6.5                          | 0.860                            | 9.24                                                  | 2.13                                                                | 0.81                                                                |
| 1              | 77.4                          | 4.0                 | 75.4                | 6.0                          | .865                             | .32                                                   | 1.95                                                                | .83                                                                 |
| 2              | 77.3                          | 3.6                 | 75.5                | 5.4                          | .868                             | .37                                                   | .73                                                                 | .84                                                                 |
| 3              | 77.3                          | 3.5                 | 75.5                | 5.3                          | .868                             | .37                                                   | .70                                                                 | .85                                                                 |
| 4              | 76.9                          | 3.2                 | 75.3                | 4.8                          | .862                             | .31                                                   | .53                                                                 | .86                                                                 |
| 5              | 76.7                          | 3.1                 | 75.1                | 4.7                          | .857                             | .25                                                   | .50                                                                 | .86                                                                 |
| 6              | 76.9                          | 3.0                 | 75.4                | 4.5                          | .865                             | .34                                                   | .44                                                                 | .87                                                                 |
| 7              | 77.8                          | 3.3                 | 76.1                | 5.0                          | .885                             | .53                                                   | .64                                                                 | .85                                                                 |
| 8              | 79.6                          | 5.5                 | 76.8                | 8.3                          | .905                             | .67                                                   | 2.90                                                                | .77                                                                 |
| 9              | 80.6                          | 6.9                 | 77.1                | 10.4                         | .913                             | .72                                                   | 3.77                                                                | .72                                                                 |
| 10             | 81.5                          | 8.4                 | 77.3                | 12.6                         | .919                             | .72                                                   | 4.74                                                                | .67                                                                 |
| 11             | 81.9                          | 10.1                | 76.8                | 15.2                         | .905                             | .54                                                   | 5.82                                                                | .62                                                                 |
| Noon.          | 82.2                          | 11.1                | 76.6                | 16.7                         | .899                             | .44                                                   | 6.51                                                                | .59                                                                 |
| 1              | 82.5                          | 11.8                | 76.6                | 17.7                         | .899                             | .42                                                   | .99                                                                 | .57                                                                 |
| 2              | 82.7                          | 12.0                | 76.7                | 18.0                         | .902                             | .45                                                   | 7.15                                                                | .57                                                                 |
| 3              | 82.2                          | 12.1                | 76.1                | 18.2                         | .885                             | .28                                                   | .13                                                                 | .57                                                                 |
| 4              | 81.7                          | 11.6                | 75.9                | 17.4                         | .879                             | .24                                                   | 6.71                                                                | .58                                                                 |
| 5              | 80.7                          | 10.4                | 75.5                | 15.6                         | .868                             | .16                                                   | 5.81                                                                | .61                                                                 |
| 6              | 79.5                          | 9.2                 | 74.9                | 13.8                         | .851                             | .02                                                   | 4.94                                                                | .65                                                                 |
| 7              | 78.3                          | 7.5                 | 74.5                | 11.3                         | .840                             | 8.98                                                  | 3.85                                                                | .70                                                                 |
| 8              | 77.9                          | 6.4                 | 74.7                | 9.6                          | .846                             | 9.05                                                  | .23                                                                 | .74                                                                 |
| 9              | 77.3                          | 5.4                 | 74.6                | 8.1                          | .843                             | .05                                                   | 2.67                                                                | .77                                                                 |
| 10             | 77.3                          | 4.9                 | 74.8                | 7.4                          | .849                             | .13                                                   | .41                                                                 | .79                                                                 |
| 11             | 77.1                          | 4.6                 | 74.8                | 6.9                          | .849                             | .13                                                   | .24                                                                 | .80                                                                 |

All the Hygrometrical elements are computed by the Greenwich Constants.



*Abstract of the Results of the Hourly Meteorological Observations  
taken at the Surveyor General's Office, Calcutta,  
in the month of May, 1859.*

Solar Radiation, Weather, &c.

| Date.             | Max. Solar radiation. | Rain Gauge 5 feet above Ground. | Prevailing direction of the Wind. | General Aspect of the Sky.                                                                                                               |
|-------------------|-----------------------|---------------------------------|-----------------------------------|------------------------------------------------------------------------------------------------------------------------------------------|
|                   | °                     | Inches.                         |                                   |                                                                                                                                          |
| 1 <i>Sunday.</i>  | 137.0                 | ..                              | W. & S. & S. E.                   | Cloudless till Noon. Scatd. ☉ till 6 P. M. cloudless afterwards.                                                                         |
| 2                 | 140.0                 | ..                              | S. & S. E.                        | Cloudless till 8 A. M. Scatd. ☉ till 4 P. M. cloudless afterwards.                                                                       |
| 3                 | 139.9                 | 1.36                            | S.                                | Cloudless till 3 A. M. Scatd. clouds till 3 P. M. cloudy afterwards; also raining & thundering & lightning between 6 & 9 P. M.           |
| 4                 | 124.0                 | ..                              | S. E.                             | Scatd. clouds or cloudy the whole day; also thundering at 2 P. M.                                                                        |
| 5                 | 129.9                 | ..                              | S. E.                             | Cloudless till 8 A. M. Scatd. ☉ & ☾ afterwards.                                                                                          |
| 6                 | 125.0                 | 0.26                            | S. E.                             | Scatd. clouds till 2 P. M. cloudy till 7 P. M. Scatd. ☾ & ☾ afterwards; also raining & thundering & lightning between 3 & 6 P. M.        |
| 7 <i>Sunday.</i>  | 148.9                 | ..                              | S. & S. E. & calm.                | Cloudless till 7 A. M. Scatd. ☾ & ☉ afterwards.                                                                                          |
| 8                 | 136.2                 | ..                              | S. & S. E. & S. W.                | Cloudless till 7 A. M. Scatd. ☉ afterwards.                                                                                              |
| 9                 | 139.2                 | ..                              | S. & S. W.                        | Cloudless till Noon. Scatd. ☉ till 4 P. M. cloudy till 8 P. M. Scatd. ☾ afterwards.                                                      |
| 10                | 140.2                 | ..                              | S. E. & S.                        | Scatd. clouds till 7 A. M.; cloudless till Noon Scatd. ☾ &c. afterwards.                                                                 |
| 11                | 142.6                 | ..                              | S. W. & S. E. & E.                | Cloudless till 3 A. M. Scatd. ☉ & ☾ till 5 P. M. cloudless afterwards.                                                                   |
| 12                | 138.0                 | ..                              | S. & E.                           | Cloudless till 11 A. M. Scatd. ☾ till 3 P. M. cloudy afterwards.                                                                         |
| 13 <i>Sunday.</i> | 142.8                 | ..                              | N. & S. & E.                      | Scatd. clouds till 6 A. M. cloudless till 1 P. M. Scatd. ☉ till 8 P. M. Scatd. ☾ afterwards.                                             |
| 14                | 138.9                 | ..                              | S.                                | Cloudless till 3 A. M. Scatd. ☾ till 7 A. M. cloudless till 11 A. M. Scatd. ☾ till 3 P. M. cloudy afterwards; also thundering at 7 P. M. |
| 15                | 129.8                 | ..                              | S. & E.                           | Scatd. clouds of various kind.                                                                                                           |
| 16                | 130.4                 | ..                              | S.                                | Scatd. clouds of various kind till 7 P. M. cloudless afterwards.                                                                         |
| 17                | 129.0                 | ..                              | S.                                | Scatd. clouds till 7 A. M. Scatd. ☾ & ☾ till 4 P. M. cloudless afterwards.                                                               |

☾ Cirri, ☾ cirro strati, ☉ cumuli, ☉ cumulo strati, ☾ nimbi, —i strati, ☾ cirro cumuli.

*Abstract of the Results of the Hourly Meteorological Observations  
taken at the Surveyor General's Office, Calcutta,  
in the month of May, 1859.*

Solar Radiation, Weather, &c.

| Date. | Max. Solar radiation. | Rain Gauge 5 feet above Ground. | Prevailing direction of the Wind. | General Aspect of the Sky.                                                                                                |
|-------|-----------------------|---------------------------------|-----------------------------------|---------------------------------------------------------------------------------------------------------------------------|
|       | °                     | Inches.                         |                                   |                                                                                                                           |
| 21    | 131.0                 | ..                              | E. & S. E. & S.                   | Cloudy till 4 A. M. Scatd. $\searrow$ i & $\nearrow$ i till 6 P. M. cloudy afterwards; also slightly drizzling at 8 P. M. |
| 22    | <i>Sunday.</i>        | 0.78                            |                                   |                                                                                                                           |
| 23    | 139.0                 | ..                              | S.                                | Cloudless till 7 A. M. Scatd. $\searrow$ i afterwards.                                                                    |
| 24    | ..                    | ..                              | S.                                | Scatd. clouds; also lightning and drizzling at 9 P. M.                                                                    |
| 25    | 130.0                 | 0.50                            | S. & E.                           | Cloudy, also raining & thundering & lightning at 6 & 7 P. M.                                                              |
| 26    | 131.0                 | ..                              | S. & N. E. & E.                   | Cloudless till 5 A. M. Scatd. $\nearrow$ i till 5 P. M. cloudless afterwards.                                             |
| 27    | ..                    | 0.12                            | S. & E. & S. E.                   | Cloudless till 3 A. M. cloudy afterwards; also thundering & lightning & drizzling between 8 & 11 P. M.                    |
| 28    | 131.8                 | ..                              | S. & S. W.                        | Scatd. clouds; also drizzled slightly at Midnight.                                                                        |
| 29    | <i>Sunday.</i>        |                                 |                                   |                                                                                                                           |
| 30    | 135.5                 | ..                              | S. & E.                           | Cloudless till 6 A. M. Scatd. $\searrow$ i & $\nearrow$ i afterwards.                                                     |
| 31    | ..                    | 0.16                            | E. & S. E.                        | Cloudy till 6 P. M. cloudless afterwards; also drizzled between 3 & 6 A. M.                                               |

*Abstract of the Results of the Hourly Meteorological Observations  
taken at the Surveyor General's Office, Calcutta,  
in the month of May, 1859.*

MONTHLY RESULTS.

|                                                                |    |    | Inches. |
|----------------------------------------------------------------|----|----|---------|
| Mean height of the Barometer for the month,                    | .. | .. | 29.699  |
| Max. height of the Barometer, occurred at 9 P. M. on the 4th,  | .. | .. | 29.905  |
| Min. height of the Barometer, occurred at 4 P. M. on the 20th, | .. | .. | 29.500  |
| <i>Extreme Range</i> of the Barometer during the month,        | .. | .. | 0.405   |
| Mean of the Daily Max. Pressures,                              | .. | .. | 29.767  |
| Ditto ditto Min. ditto,                                        | .. | .. | 29.612  |
| <i>Mean Daily range</i> of the Barometer during the month,     | .. | .. | 0.155   |

|                                                               |    |    | °    |
|---------------------------------------------------------------|----|----|------|
| Mean Dry Bulb Thermometer for the month,                      | .. | .. | 86.1 |
| Max. Temperature, occurred at 3 P. M. on the 13th,            | .. | .. | 99.4 |
| Min. Temperature occurred at 2 A. M. on the 5th,              | .. | .. | 72.0 |
| <i>Extreme Range</i> of the Temperature during the month,     | .. | .. | 27.4 |
| Mean of the Daily Max. Temperatures,                          | .. | .. | 95.5 |
| Ditto ditto Min. ditto,                                       | .. | .. | 78.4 |
| <i>Mean Daily range</i> of the Temperatures during the month, | .. | .. | 17.1 |

|                                                            |    |    | °    |
|------------------------------------------------------------|----|----|------|
| Mean Wet Bulb Thermometer for the month,                   | .. | .. | 79.2 |
| Mean Dry Bulb Thermometer above Mean Wet Bulb Thermometer, | .. | .. | 6.9  |
| Computed Mean Dew Point for the month,                     | .. | .. | 75.7 |
| Mean Dry Bulb Thermometer above computed Mean Dew Point,   | .. | .. | 10.4 |

|                                             |    |    | Inches. |
|---------------------------------------------|----|----|---------|
| Mean Elastic force of vapour for the month, | .. | .. | 0.873   |

|                                                                         |    |    | Troy grains. |
|-------------------------------------------------------------------------|----|----|--------------|
| Mean weight of vapour for the month,                                    | .. | .. | 9.32         |
| Additional weight of vapour required for complete saturation,           | .. | .. | 3.63         |
| Mean degree of Humidity for the month, complete saturation being unity, | .. | .. | 0.72         |

|                                                   |    |    | Inches.         |
|---------------------------------------------------|----|----|-----------------|
| Rained 9 days.—Max. fall of rain during 24 hours, | .. | .. | 1.36            |
| Total amount of rain during the month,            | .. | .. | 3.18            |
| Prevailing direction of the Wind, ..              | .. | .. | S. & S. E. & E. |

*Abstract of the Results of the Hourly Meteorological Observations  
taken at the Surveyor General's Office, Calcutta,  
in the month of May, 1859.*

## MONTHLY RESULTS.

Table showing the number of days on which at a given hour any particular wind  
blew, together with the number of days on which at the same hour,  
when any particular wind was blowing, it rained.

| Hour.     | N.           | Rain on.<br>N. E. | Rain on.<br>E. | Rain on.<br>S. E. | Rain on.<br>S. | Rain on.<br>S. W. | Rain on.<br>W. | Rain on.<br>N. W. | Rain on.<br>Calm. | Rain on.<br>Missed. |
|-----------|--------------|-------------------|----------------|-------------------|----------------|-------------------|----------------|-------------------|-------------------|---------------------|
|           | No. of days. |                   |                |                   |                |                   |                |                   |                   |                     |
| Midnight. | 1            | 1                 | 4              | 1                 | 5              | 13                |                |                   |                   |                     |
| 1         | 1            | 1                 | 4              |                   | 5              | 13                | 1              |                   | 1                 |                     |
| 2         | 1            | 1                 | 4              |                   | 5              | 13                | 1              |                   | 1                 |                     |
| 3         | 1            | 1                 | 3              |                   | 5              | 11                | 1              |                   | 1                 | 3                   |
| 4         | 1            | 2                 | 3              |                   | 6              | 11                | 1              |                   | 1                 |                     |
| 5         | 1            | 2                 | 4              |                   | 5              | 12                | 1              |                   |                   |                     |
| 6         | 1            | 1                 | 5              |                   | 5              | 11                | 2              | 1                 |                   |                     |
| 7         | 1            | 1                 | 4              |                   | 6              | 11                | 1              |                   | 2                 |                     |
| 8         | 1            | 1                 |                |                   | 8              | 13                |                | 1                 | 1                 |                     |
| 9         | 2            |                   | 2              |                   | 5              | 14                | 2              | 1                 |                   |                     |
| 10        | 1            |                   | 2              |                   | 6              | 14                | 2              | 1                 |                   |                     |
| 11        | 1            |                   | 2              |                   | 4              | 14                | 5              |                   |                   |                     |
| Noon.     |              |                   | 2              |                   | 7              | 15                | 2              |                   |                   |                     |
| 1         |              |                   | 2              |                   | 7              | 14                |                | 1                 |                   |                     |
| 2         |              |                   | 2              |                   | 7              | 12                | 4              | 1                 |                   |                     |
| 3         |              |                   | 2              |                   | 6              | 12                |                | 1                 |                   |                     |
| 4         |              |                   | 1              |                   | 4              | 12                | 7              |                   |                   | 2                   |
| 5         | 1            |                   | 1              | 1                 | 4              | 16                | 4              |                   |                   |                     |
| 6         |              | 1                 | 3              |                   | 4              | 14                | 1              |                   | 1                 |                     |
| 7         | 1            | 1                 | 6              | 1                 | 4              | 13                |                | 1                 | 1                 |                     |
| 8         | 1            | 1                 | 5              | 1                 | 7              | 12                |                |                   |                   | 1                   |
| 9         |              | 2                 | 8              | 2                 | 7              | 8                 |                |                   |                   | 1                   |
| 10        |              | 1                 | 8              | 1                 | 8              | 8                 |                |                   | 1                 |                     |
| 11        |              | 1                 | 11             | 1                 | 6              | 8                 |                |                   |                   |                     |

# Meteorological Observations.

## Abstract of the Results of the Hourly Meteorological Observations taken at the Surveyor General's Office, Calcutta, in the month of June, 1859.

Latitude 22° 33' 1" North. Longitude 88° 20' 34" East.

feet.

Height of the Cistern of the Standard Barometer above the Sea level, 18.11

Daily Means, &c. of the Observations and of the Hygrometrical elements  
dependent thereon.

| Date. | Mean Height of<br>the Barometer<br>at 32° Fahr. | Range of the Barometer<br>during the day. |         |         | Mean Dry Bulb<br>Thermometer. | Range of the Tempera-<br>ture during the day. |      |       |
|-------|-------------------------------------------------|-------------------------------------------|---------|---------|-------------------------------|-----------------------------------------------|------|-------|
|       |                                                 | Max.                                      | Min.    | Diff.   |                               | Max.                                          | Min. | Diff. |
|       | Inches.                                         | Inches.                                   | Inches. | Inches. | o                             | o                                             | o    | o     |
| 1     | 29.616                                          | 29.661                                    | 29.550  | 0.111   | 82.9                          | 88.6                                          | 80.2 | 8.4   |
| 2     | .616                                            | .661                                      | .570    | .091    | 82.6                          | 87.8                                          | 80.7 | 7.1   |
| 3     | .678                                            | .730                                      | .631    | .099    | 82.3                          | 87.8                                          | 79.4 | 8.4   |
| 4     | .637                                            | .692                                      | .550    | .142    | 82.9                          | 88.4                                          | 80.0 | 8.4   |
| 5     | <i>Sunday.</i>                                  |                                           |         |         |                               |                                               |      |       |
| 6     | .672                                            | .720                                      | .629    | .091    | 80.2                          | 84.6                                          | 77.5 | 7.1   |
| 7     | .667                                            | .711                                      | .595    | .116    | 84.7                          | 90.2                                          | 80.8 | 9.4   |
| 8     | .651                                            | .698                                      | .590    | .108    | 85.6                          | 90.8                                          | 81.8 | 9.0   |
| 9     | .638                                            | .694                                      | .577    | .117    | 86.2                          | 92.2                                          | 81.8 | 10.4  |
| 10    | .624                                            | .697                                      | .541    | .156    | 86.8                          | 93.0                                          | 82.0 | 11.0  |
| 11    | .552                                            | .612                                      | .454    | .158    | 86.9                          | 94.6                                          | 82.8 | 11.8  |
| 12    | <i>Sunday.</i>                                  |                                           |         |         |                               |                                               |      |       |
| 13    | .422                                            | .521                                      | .331    | .190    | 85.6                          | 90.5                                          | 82.4 | 8.1   |
| 14    | .303                                            | .368                                      | .217    | .151    | 86.9                          | 93.3                                          | 80.2 | 13.1  |
| 15    | .287                                            | .348                                      | .228    | .120    | 86.4                          | 91.6                                          | 82.0 | 9.6   |
| 16    | .368                                            | .438                                      | .303    | .135    | 88.4                          | 96.8                                          | 83.8 | 13.0  |
| 17    | .470                                            | .524                                      | .415    | .109    | 87.7                          | 94.8                                          | 82.6 | 12.2  |
| 18    | .502                                            | .556                                      | .451    | .105    | 85.1                          | 90.6                                          | 81.4 | 9.2   |
| 19    | <i>Sunday.</i>                                  |                                           |         |         |                               |                                               |      |       |
| 20    | .246                                            | .338                                      | .152    | .186    | 81.1                          | 85.4                                          | 79.0 | 6.4   |
| 21    | .233                                            | .429                                      | .059    | .370    | 79.5                          | 82.2                                          | 77.8 | 4.4   |
| 22    | .494                                            | .554                                      | .419    | .135    | 81.4                          | 85.0                                          | 78.0 | 7.0   |
| 23    | .558                                            | .602                                      | .521    | .081    | 84.4                          | 88.6                                          | 81.1 | 7.5   |
| 24    | .585                                            | .633                                      | .533    | .100    | 84.7                          | 90.0                                          | 81.0 | 9.0   |
| 25    | .603                                            | .650                                      | .556    | .094    | 84.1                          | 89.5                                          | 80.0 | 9.5   |
| 26    | <i>Sunday.</i>                                  |                                           |         |         |                               |                                               |      |       |
| 27    | .602                                            | .655                                      | .535    | .120    | 83.4                          | 89.4                                          | 79.9 | 9.5   |
| 28    | .590                                            | .663                                      | .536    | .127    | 83.6                          | 88.5                                          | 81.0 | 7.5   |
| 29    | .595                                            | .643                                      | .549    | .094    | 85.5                          | 91.1                                          | 80.8 | 10.3  |
| 30    | .595                                            | .637                                      | .540    | .097    | 86.1                          | 91.0                                          | 82.2 | 8.8   |

The Mean height of the Barometer, as likewise the Mean Dry and Wet Bulb Thermometers are derived from the twenty-four hourly observations made during the day.

*Abstract of the Results of the Hourly Meteorological Observations  
taken at the Surveyor General's Office, Calcutta,  
in the month of June, 1859.*

Daily Means, &c. of the Observations and of the Hygrometrical elements  
dependent thereon.—(Continued.)

| Date. | Mean Wet Bulb Thermo-<br>meter. | Dry Bulb above Wet. | Computed Dew Point. | Dry Bulb above Dew<br>Point. | Mean Elastic force of<br>Vapour. | Mean Weight of Vapour<br>in a cubic foot of Air. | Additional Weight of Va-<br>pour required for com-<br>plete saturation. | Mean degree of Humidity,<br>complete saturation be-<br>ing unity. |
|-------|---------------------------------|---------------------|---------------------|------------------------------|----------------------------------|--------------------------------------------------|-------------------------------------------------------------------------|-------------------------------------------------------------------|
|       | o                               | o                   | o                   | o                            | Inches.                          | T. gr.                                           | T. gr.                                                                  |                                                                   |
| 1     | 79.6                            | 3.3                 | 77.9                | 5.0                          | .937                             | 10.06                                            | 1.73                                                                    | 0.85                                                              |
| 2     | 79.4                            | 3.2                 | 77.8                | 4.8                          | .934                             | .03                                              | .65                                                                     | .86                                                               |
| 3     | 79.6                            | 2.7                 | 78.2                | 4.1                          | .946                             | .17                                              | .41                                                                     | .88                                                               |
| 4     | 79.6                            | 3.3                 | 77.9                | 5.0                          | .937                             | .06                                              | .73                                                                     | .85                                                               |
| 5     | <i>Sunday.</i>                  |                     |                     |                              |                                  |                                                  |                                                                         |                                                                   |
| 6     | 78.2                            | 2.0                 | 77.2                | 3.0                          | .916                             | 9.89                                             | 0.99                                                                    | .91                                                               |
| 7     | 81.3                            | 3.4                 | 79.6                | 5.1                          | .989                             | 10.58                                            | 1.84                                                                    | .85                                                               |
| 8     | 81.5                            | 4.1                 | 79.4                | 6.2                          | .983                             | .49                                              | 2.27                                                                    | .82                                                               |
| 9     | 81.3                            | 4.9                 | 78.8                | 7.4                          | .964                             | .29                                              | .70                                                                     | .79                                                               |
| 10    | 81.6                            | 5.2                 | 79.0                | 7.8                          | .970                             | .33                                              | .88                                                                     | .78                                                               |
| 11    | 81.9                            | 5.0                 | 79.4                | 7.5                          | .983                             | .45                                              | .80                                                                     | .79                                                               |
| 12    | <i>Sunday.</i>                  |                     |                     |                              |                                  |                                                  |                                                                         |                                                                   |
| 13    | 81.6                            | 4.0                 | 79.6                | 6.0                          | .989                             | .56                                              | .20                                                                     | .83                                                               |
| 14    | 82.2                            | 4.7                 | 79.8                | 7.1                          | .995                             | .60                                              | .65                                                                     | .80                                                               |
| 15    | 81.8                            | 4.6                 | 79.5                | 6.9                          | .986                             | .51                                              | .55                                                                     | .81                                                               |
| 16    | 81.3                            | 7.1                 | 77.7                | 10.7                         | .931                             | 9.88                                             | 3.96                                                                    | .71                                                               |
| 17    | 82.7                            | 5.0                 | 80.2                | 7.5                          | 1.008                            | 10.71                                            | 2.85                                                                    | .79                                                               |
| 18    | 81.1                            | 4.0                 | 79.1                | 6.0                          | 0.973                            | .40                                              | .17                                                                     | .83                                                               |
| 19    | <i>Sunday.</i>                  |                     |                     |                              |                                  |                                                  |                                                                         |                                                                   |
| 20    | 78.3                            | 2.8                 | 76.9                | 4.2                          | .908                             | 9.78                                             | 1.39                                                                    | .88                                                               |
| 21    | 77.7                            | 1.8                 | 76.8                | 2.7                          | .905                             | .77                                              | 0.89                                                                    | .92                                                               |
| 22    | 77.7                            | 3.7                 | 75.8                | 5.6                          | .876                             | .43                                              | 1.84                                                                    | .84                                                               |
| 23    | 79.9                            | 4.5                 | 77.6                | 6.8                          | .928                             | .93                                              | 2.33                                                                    | .81                                                               |
| 24    | 80.4                            | 4.3                 | 78.2                | 6.5                          | .946                             | 10.11                                            | .31                                                                     | .81                                                               |
| 25    | 80.4                            | 3.7                 | 78.5                | 5.6                          | .955                             | .23                                              | 1.98                                                                    | .84                                                               |
| 26    | <i>Sunday.</i>                  |                     |                     |                              |                                  |                                                  |                                                                         |                                                                   |
| 27    | 80.0                            | 3.4                 | 78.3                | 5.1                          | .949                             | .18                                              | .78                                                                     | .85                                                               |
| 28    | 80.1                            | 3.5                 | 78.3                | 5.3                          | .949                             | .18                                              | .85                                                                     | .85                                                               |
| 29    | 80.8                            | 4.7                 | 78.4                | 7.1                          | .952                             | .17                                              | 2.55                                                                    | .80                                                               |
| 30    | 81.5                            | 4.6                 | 79.2                | 6.9                          | .976                             | .41                                              | .54                                                                     | .80                                                               |

All the Hygrometrical elements are computed by the Greenwich constants.

*Abstract of the Results of the Hourly Meteorological Observations  
taken at the Surveyor General's Office, Calcutta,  
in the month of June, 1859.*

Hourly Means, &c. of the Observations and of the Hygrometrical elements  
dependent thereon.

| Hour.          | Mean Height of<br>the Barometer<br>at 32° Fahr. | Range of the Barometer for<br>each hour during the<br>month. |         |         | Mean Dry Bulb<br>Thermometer. | Range of the Tempera-<br>ture for each hour<br>during the<br>month. |      |       |
|----------------|-------------------------------------------------|--------------------------------------------------------------|---------|---------|-------------------------------|---------------------------------------------------------------------|------|-------|
|                |                                                 | Max.                                                         | Min.    | Diff.   |                               | Max.                                                                | Min. | Diff. |
|                | Inches.                                         | Inches.                                                      | Inches. | Inches. | o                             | o                                                                   | o    | o     |
| Mid-<br>night. | 29.541                                          | 29.698                                                       | 29.172  | 0.526   | 82.3                          | 86.2                                                                | 78.3 | 7.9   |
| 1              | .530                                            | .682                                                         | .162    | .520    | 82.1                          | 86.0                                                                | 78.1 | 7.9   |
| 2              | .527                                            | .670                                                         | .149    | .521    | 81.7                          | 86.0                                                                | 78.0 | 8.0   |
| 3              | .508                                            | .662                                                         | .140    | .522    | 81.4                          | 84.9                                                                | 77.8 | 7.1   |
| 4              | .510                                            | .672                                                         | .135    | .537    | 81.1                          | 84.4                                                                | 77.5 | 6.9   |
| 5              | .518                                            | .678                                                         | .125    | .553    | 81.0                          | 84.0                                                                | 77.8 | 6.2   |
| 6              | .537                                            | .688                                                         | .115    | .573    | 81.2                          | 84.3                                                                | 78.0 | 6.3   |
| 7              | .550                                            | .696                                                         | .091    | .605    | 82.1                          | 85.8                                                                | 78.2 | 7.6   |
| 8              | .560                                            | .715                                                         | .059    | .656    | 83.6                          | 86.6                                                                | 78.3 | 8.3   |
| 9              | .572                                            | .724                                                         | .166    | .558    | 85.3                          | 88.6                                                                | 78.4 | 10.2  |
| 10             | .575                                            | .730                                                         | .205    | .525    | 86.4                          | 89.8                                                                | 79.0 | 10.8  |
| 11             | .570                                            | .716                                                         | .230    | .486    | 87.1                          | 92.6                                                                | 80.2 | 12.4  |
| Noon.          | .557                                            | .705                                                         | .250    | .455    | 87.9                          | 93.2                                                                | 80.8 | 12.4  |
| 1              | .537                                            | .690                                                         | .249    | .441    | 88.3                          | 94.6                                                                | 80.8 | 13.8  |
| 2              | .515                                            | .668                                                         | .215    | .453    | 88.7                          | 96.6                                                                | 80.5 | 16.1  |
| 3              | .495                                            | .642                                                         | .188    | .454    | 88.1                          | 96.6                                                                | 80.5 | 16.1  |
| 4              | .477                                            | .641                                                         | .172    | .469    | 87.6                          | 96.8                                                                | 79.9 | 16.9  |
| 5              | .479                                            | .631                                                         | .152    | .479    | 86.6                          | 95.8                                                                | 79.6 | 16.2  |
| 6              | .490                                            | .634                                                         | .168    | .466    | 85.6                          | 92.6                                                                | 79.6 | 13.0  |
| 7              | .509                                            | .663                                                         | .183    | .480    | 84.4                          | 88.8                                                                | 79.7 | 9.1   |
| 8              | .529                                            | .691                                                         | .191    | .500    | 83.7                          | 88.3                                                                | 79.6 | 8.7   |
| 9              | .548                                            | .705                                                         | .189    | .516    | 83.4                          | 87.8                                                                | 78.6 | 9.2   |
| 10             | .558                                            | .712                                                         | .186    | .526    | 83.1                          | 87.4                                                                | 78.2 | 9.2   |
| 11             | .562                                            | .708                                                         | .183    | .525    | 82.9                          | 86.6                                                                | 79.6 | 7.0   |

The Mean height of the Barometer, as likewise the Mean Dry and Wet Bulb Thermometers are derived from the observations made at the several hours during the month.

*Abstract of the Results of the Hourly Meteorological Observations  
taken at the Surveyor General's Office, Calcutta,  
in the month of June, 1859.*

Hourly Means, &c. of the Observations and of the Hygrometrical elements  
dependent thereon.—(Continued.)

| Hour.          | Mean Wet Bulb Ther-<br>mometer. | Dry Bulb above Wet. | Computed Dew Point. | Dry Bulb above Dew<br>Point. | Mean Elastic Force<br>of Vapour. | Mean Weight of Va-<br>pour in a cubic<br>foot of Air. | Additional Weight of<br>Vapour required<br>for complete satu-<br>ration. | Mean degree of Hu-<br>midity, complete<br>saturation being<br>unity. |
|----------------|---------------------------------|---------------------|---------------------|------------------------------|----------------------------------|-------------------------------------------------------|--------------------------------------------------------------------------|----------------------------------------------------------------------|
|                | o                               | o                   | o                   | o                            | Inches.                          | T. gr.                                                | T. gr.                                                                   |                                                                      |
| Mid-<br>night. | 79.7                            | 2.6                 | 78.4                | 3.9                          | 0.952                            | 10.23                                                 | 1.35                                                                     | 0.88                                                                 |
| 1              | 79.3                            | 2.8                 | 77.9                | 4.2                          | .937                             | .08                                                   | .43                                                                      | .88                                                                  |
| 2              | 79.4                            | 2.3                 | 78.2                | 3.5                          | .946                             | .17                                                   | .20                                                                      | .89                                                                  |
| 3              | 79.0                            | 2.4                 | 77.8                | 3.6                          | .934                             | .05                                                   | .22                                                                      | .89                                                                  |
| 4              | 78.8                            | 2.3                 | 77.6                | 3.5                          | .928                             | 9.99                                                  | .18                                                                      | .89                                                                  |
| 5              | 78.6                            | 2.4                 | 77.4                | 3.6                          | .922                             | .93                                                   | .21                                                                      | .89                                                                  |
| 6              | 78.8                            | 2.4                 | 77.6                | 3.6                          | .928                             | .99                                                   | .22                                                                      | .89                                                                  |
| 7              | 79.3                            | 2.8                 | 77.9                | 4.2                          | .937                             | 10.08                                                 | .43                                                                      | .88                                                                  |
| 8              | 80.2                            | 3.4                 | 78.5                | 5.1                          | .955                             | .25                                                   | .78                                                                      | .85                                                                  |
| 9              | 81.0                            | 4.3                 | 78.8                | 6.5                          | .964                             | .29                                                   | 2.35                                                                     | .81                                                                  |
| 10             | 81.4                            | 5.0                 | 78.9                | 7.5                          | .967                             | .30                                                   | .76                                                                      | .79                                                                  |
| 11             | 81.7                            | 5.4                 | 79.0                | 8.1                          | .970                             | .33                                                   | 3.00                                                                     | .78                                                                  |
|                |                                 |                     |                     |                              |                                  |                                                       |                                                                          |                                                                      |
| Noon.          | 82.0                            | 5.9                 | 79.0                | 8.9                          | .970                             | .31                                                   | .33                                                                      | .76                                                                  |
| 1              | 82.1                            | 6.2                 | 79.0                | 9.3                          | .970                             | .31                                                   | .49                                                                      | .75                                                                  |
| 2              | 82.1                            | 6.6                 | 78.8                | 9.9                          | .964                             | .23                                                   | .73                                                                      | .73                                                                  |
| 3              | 82.0                            | 6.1                 | 78.9                | 9.2                          | .967                             | .28                                                   | .44                                                                      | .75                                                                  |
| 4              | 81.6                            | 6.0                 | 78.6                | 9.0                          | .958                             | .19                                                   | .33                                                                      | .75                                                                  |
| 5              | 81.0                            | 5.6                 | 78.2                | 8.4                          | .946                             | .09                                                   | .05                                                                      | .77                                                                  |
| 6              | 80.9                            | 4.7                 | 78.5                | 7.1                          | .955                             | .21                                                   | 2.55                                                                     | .80                                                                  |
| 7              | 80.5                            | 3.9                 | 78.5                | 5.9                          | .955                             | .23                                                   | .08                                                                      | .83                                                                  |
| 8              | 80.3                            | 3.4                 | 78.6                | 5.1                          | .958                             | .28                                                   | 1.79                                                                     | .85                                                                  |
| 9              | 80.2                            | 3.2                 | 78.6                | 4.8                          | .958                             | .28                                                   | .68                                                                      | .86                                                                  |
| 10             | 80.1                            | 3.0                 | 78.6                | 4.5                          | .958                             | .28                                                   | .58                                                                      | .87                                                                  |
| 11             | 80.0                            | 2.9                 | 78.5                | 4.4                          | .955                             | .27                                                   | .52                                                                      | .87                                                                  |

All the Hygrometrical elements are computed by the Greenwich constants.



*Abstract of the Results of the Hourly Meteorological Observations  
taken at the Surveyor General's Office, Calcutta,  
in the month of June, 1859.*

Solar Radiation, Weather, &c.

| Date. | Max. Solar radiation. | Rain Gauge 5 feet above Ground. | Prevailing direction of the Wind. | General Aspect of the Sky.                                                                                                                 |
|-------|-----------------------|---------------------------------|-----------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------|
|       | o                     | Inches.                         |                                   |                                                                                                                                            |
| 1     | ..                    | 0.34                            | S. W. & E.                        | Cloudless till 5 A. M. Scatd. \i & \i till 9 A. M. cloudy till 6 P. M. Scatd. \i afterwards : also raining between 10 A. M. & 1 P. M.      |
| 2     | ..                    | ...                             | S. E. & E.                        | Cloudless till 4 A. M. cloudy afterwards, also drizzling at 6 and 7 and 10 A. M. & at Noon & 3 P. M. ; thundering and lightning at 3 P. M. |
| 3     | ..                    | 0.47                            | E. & S. E.                        | Cloudy ; also raining between 1 & 3 & likewise between 10 & 11 A. M.                                                                       |
| 4     | ..                    | 0.74                            | S. E. & S.                        | Scatd. clouds, also raining at Noon, also between 4 & 6 P. M.                                                                              |
| 5     | Sunday.               | 2.96                            |                                   |                                                                                                                                            |
| 6     | ..                    | 1.60                            | S. & S. E. & E.                   | Cloudy ; also constantly raining.                                                                                                          |
| 7     | ..                    | 0.26                            | S. & S. E.                        | Cloudy with rain at 1 P. M.                                                                                                                |
| 8     | ..                    | ..                              | S. & S. E.                        | Scatd. \i till 6 A. M. Scatd. clouds afterwards.                                                                                           |
| 9     | 126.2                 | ..                              | S.                                | Cloudy till 7 A. M. Scatd. \i afterwards.                                                                                                  |
| 10    | 131.0                 | ..                              | S.                                | Cloudless till 4 A. M. Scatd. \i till 4 P. M. Scatd. clouds afterwards.                                                                    |
| 11    | 131.6                 | ..                              | S. & S. E. & E.                   | Scatd. clouds.                                                                                                                             |
| 12    | Sunday.               | ..                              |                                   |                                                                                                                                            |
| 13    | ..                    | 0.36                            | N. E. & N.                        | Scatd. \i till 2 A. M. cloudy till 5 P. M. Scatd. \i afterwards ; also raining at 8 A. M & between 10 A. M. & Noon.                        |
| 14    | ..                    | 1.08                            | N. & N. W.                        | Cloudy ; also raining at 1 and 3 A. M. & also at 3 P. M.                                                                                   |
| 15    | ..                    | 0.19                            | W. & N. W.                        | Cloudy ; also drizzling at 3 & 4 A. M. & between Noon & 1 P. M.                                                                            |
| 16    | ..                    | 0.25                            | W. & S. W.                        | Cloudy ; also raining at 7 & 10 P. M.                                                                                                      |
| 17    | ..                    | 0.34                            | W. & S. W.                        | Cloudy ; also raining at Midnight and 2 A. M. as likewise at 5 & 6 P. M.                                                                   |
| 18    | ..                    | 0.39                            | S. W. & S.                        | Cloudy ; also drizzling between 1 and 6 P. M.                                                                                              |
| 19    | Sunday.               | 2.41                            |                                   |                                                                                                                                            |
| 20    | ..                    | 0.09                            | N. W. & N. E. & N.                | Cloudy ; also drizzling at 7 and 8 A. M. as likewise at 5 & 10 P. M.                                                                       |
| 21    | ..                    | 0.28                            | N. & S. E. & S.                   | Cloudy ; also drizzling constantly.                                                                                                        |
| 22    | ..                    | 0.55                            | S.                                | Cloudy till 7 P. M. cloudless afterwards ; also raining at Midnight 1 A. M. 11 A. M. Noon & 3 P. M.                                        |
| 23    | ..                    | ..                              | S.                                | Scatd. clouds.                                                                                                                             |

\i Cirri, \i Cirro strati, \i Cumuli, \i Cumulo strati, \i Nimbi, —i Strati, \i Cirro cumuli.

*Abstract of the Results of the Hourly Meteorological Observations  
taken at the Surveyor General's Office, Calcutta,  
in the month of June, 1859.*

Solar Radiation, Weather, &c.

| Date. | Max. Solar radiation. | Rain Gauge 5 feet above Ground. | Prevailing direction of the Wind. | General Aspect of the Sky.                                                                                       |
|-------|-----------------------|---------------------------------|-----------------------------------|------------------------------------------------------------------------------------------------------------------|
|       | °                     | Inches.                         |                                   |                                                                                                                  |
| 24    | 117.8                 | ..                              | S.                                | Scatd. clouds; also very slightly drizzling at 1 A. M. & 11 P. M.                                                |
| 25    | 120.5                 | ..                              | S. & S. W.                        | Cloudy.                                                                                                          |
| 26    | <i>Sunday.</i>        |                                 |                                   |                                                                                                                  |
| 27    | ..                    | 0.09                            | S. W. & S.                        | Cloudy; also drizzling between 1 & 2 A. M. & between 5 & 8 P. M.                                                 |
| 28    | ..                    | 0.08                            | S.                                | Cloudy; till 2 P. M. Scatd. $\searrow$ i till 7 P. M. cloudless afterwards, also drizzling between 10 & 11 A. M. |
| 29    | 124.0                 | ..                              | S. W. & S.                        | Cloudless till 8 A. M. Scatd. $\circ$ i till 6 P. M. cloudless afterwards.                                       |
| 30    | 123.0                 | ..                              | S.                                | Cloudless till 2 A. M. Scatd. $\searrow$ i & $\circ$ i till 7 P. M. cloudless afterwards.                        |

*Abstract of the Results of the Hourly Meteorological Observations  
taken at the Surveyor General's Office, Calcutta,  
in the month of June, 1859.*

MONTHLY RESULTS.

|                                                               |    |    | Inches. |
|---------------------------------------------------------------|----|----|---------|
| Mean height of the Barometer for the month,                   | .. | .. | 29.532  |
| Max. height of the Barometer occurred at 10 A. M. on the 3rd, | .. | .. | 29.730  |
| Min. height of the Barometer occurred at 8 A. M. on the 21st, | .. | .. | 29.059  |
| <i>Extreme range</i> of the Barometer during the month,       | .. | .. | 0.671   |
| Mean of the daily Max. Pressures,                             | .. | .. | 29.594  |
| Ditto ditto Min. ditto,                                       | .. | .. | 29.463  |
| <i>Mean daily range</i> of the Barometer during the month,    | .. | .. | 0.131   |

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|                                                              |    |    | °    |
|--------------------------------------------------------------|----|----|------|
| Mean Dry Bulb Thermometer for the month,                     | .. | .. | 84.4 |
| Max. Temperature occurred at 4 P. M. on the 16th,            | .. | .. | 96.8 |
| Min. Temperature occurred at 4 A. M. on the 6th,             | .. | .. | 77.5 |
| <i>Extreme range</i> of the Temperature during the month,    | .. | .. | 19.3 |
| Mean of the daily Max. Temperatures,                         | .. | .. | 89.9 |
| Ditto ditto Min. ditto,                                      | .. | .. | 80.8 |
| <i>Mean daily range</i> of the Temperature during the month, | .. | .. | 9.1  |

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|                                                            |    |    | °      |
|------------------------------------------------------------|----|----|--------|
| Mean Wet Bulb Thermometer for the month,                   | .. | .. | 80.4   |
| Mean Dry Bulb Thermometer above Mean Wet Bulb Thermometer, | .. | .. | 4.0    |
| Computed Mean Dew-point for the month,                     | .. | .. | 78.4   |
| Mean Dry Bulb Thermometer above computed Mean Dew-point,   | .. | .. | 6.0    |
|                                                            |    |    | Inches |
| Mean Elastic force of Vapour for the month,                | .. | .. | 0.952  |

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|                                                                         |    |    | Troy grains. |
|-------------------------------------------------------------------------|----|----|--------------|
| Mean Weight of Vapour for the month,                                    | .. | .. | 10.19        |
| Additional Weight of Vapour required for complete saturation,           | .. | .. | 2.12         |
| Mean degree of humidity for the month, complete saturation being unity, | .. | .. | 0.83         |

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|                                                    |    |    | Inches.    |
|----------------------------------------------------|----|----|------------|
| Rained 20 days, Max. fall of rain during 24 hours, | .. | .. | 2.96       |
| Total amount of rain during the month,             | .. | .. | 12.48      |
| Prevailing direction of the Wind,                  | .. | .. | S. & S. W. |

*Abstract of the Results of the Hourly Meteorological Observations  
taken at the Surveyor General's Office, Calcutta,  
in the month of June, 1859.*

MONTHLY RESULTS.

Table showing the number of days on which at a given hour any particular wind  
blew, together with the number of days on which at the same hour when  
any particular wind was blowing, it rained.

| Hour.     | N.           | Rain on.<br>N. | N. E. | Rain on.<br>N. E. | E. | Rain on.<br>E. | S. E. | Rain on.<br>S. E. | S. | Rain on.<br>S. | S. W. | Rain on.<br>S. W. | W. | Rain on.<br>W. | N. W. | Rain on.<br>N. W. | Calm. | Rain on.<br>Calm. | Missed. |
|-----------|--------------|----------------|-------|-------------------|----|----------------|-------|-------------------|----|----------------|-------|-------------------|----|----------------|-------|-------------------|-------|-------------------|---------|
|           | No. of days. |                |       |                   |    |                |       |                   |    |                |       |                   |    |                |       |                   |       |                   |         |
| Midnight. | 3            | 1              | 1     |                   | 5  | 2              | 1     |                   | 9  |                | 1     |                   | 2  |                | 2     |                   | 2     |                   |         |
| 1         | 2            | 1              | 1     |                   | 5  | 2              | 1     |                   | 8  | 1              | 3     | 1                 | 2  |                | 2     |                   | 2     |                   |         |
| 2         | 2            | 1              | 1     |                   | 4  | 2              | 1     |                   | 9  |                | 4     | 1                 | 2  |                | 1     |                   | 1     |                   |         |
| 3         | 2            | 1              | 1     |                   | 3  | 2              | 1     |                   | 11 |                | 3     |                   | 3  | 1              | 1     |                   | 1     |                   | 1       |
| 4         | 1            | 1              | 1     |                   | 3  | 1              | 2     |                   | 10 |                | 3     |                   | 3  | 1              | 1     |                   |       |                   | 1       |
| 5         | 1            | 1              | 3     |                   | 2  |                | 1     |                   | 11 | 1              | 3     |                   | 2  |                | 2     |                   |       |                   | 1       |
| 6         | 2            | 1              | 3     |                   | 3  | 1              | 1     |                   | 11 | 1              | 3     |                   | 2  |                | 1     |                   |       |                   |         |
| 7         | 1            | 1              | 3     |                   | 2  |                | 2     |                   | 11 | 1              | 3     |                   | 2  |                | 2     |                   | 1     |                   |         |
| 8         | 2            | 1              |       |                   | 5  | 1              |       |                   | 14 | 1              | 2     |                   | 2  |                | 1     |                   | 1     |                   |         |
| 9         | 2            |                |       |                   | 4  | 1              |       |                   | 14 |                | 2     |                   | 3  |                | 1     |                   |       |                   |         |
| 10        | 2            |                |       |                   | 1  | 1              | 2     | 1                 | 13 |                | 3     | 1                 | 3  | 1              | 2     |                   |       |                   |         |
| 11        | 3            | 1              |       |                   | 1  | 1              | 5     | 2                 | 10 | 2              | 4     |                   | 1  | 1              | 2     |                   |       |                   |         |
| Noon.     | 4            | 1              | 1     |                   | 1  |                | 5     | 3                 | 8  | 1              | 5     |                   | 1  |                | 1     |                   |       |                   |         |
| 1         | 2            | 1              | 1     |                   |    |                | 7     | 2                 | 11 | 2              | 3     |                   | 2  | 1              |       |                   |       |                   |         |
| 2         | 1            | 1              | 1     |                   |    |                | 7     |                   | 10 | 1              | 4     |                   | 1  |                | 2     |                   |       |                   |         |
| 3         | 2            | 1              | 1     |                   | 2  | 1              | 6     | 3                 | 10 |                | 3     |                   | 1  |                | 1     |                   |       |                   |         |
| 4         | 1            | 2              |       |                   | 1  |                | 4     | 1                 | 11 | 1              | 2     |                   | 3  |                | 1     |                   |       |                   | 1       |
| 5         | 2            | 1              | 1     |                   |    |                | 4     | 1                 | 13 | 1              | 3     | 2                 | 2  | 1              | 1     |                   |       |                   |         |
| 6         | 2            |                |       |                   | 2  |                | 3     | 1                 | 12 |                | 4     | 1                 | 2  | 1              | 1     |                   |       |                   |         |
| 7         | 2            | 1              |       |                   | 2  |                | 3     |                   | 12 |                | 5     | 2                 |    |                | 1     |                   |       |                   |         |
| 8         | 2            | 1              |       |                   |    |                | 4     |                   | 12 |                | 4     |                   |    |                | 1     |                   | 2     |                   |         |
| 9         | 2            | 1              |       |                   | 1  | 1              | 2     |                   | 13 |                | 3     |                   | 1  |                |       |                   | 3     |                   |         |
| 10        | 1            | 2              | 1     |                   | 1  | 1              | 2     |                   | 13 |                | 3     | 1                 | 1  |                |       |                   | 3     |                   |         |
| 11        | 2            | 1              |       |                   | 2  |                | 2     |                   | 12 | 1              | 3     |                   | 1  |                |       |                   |       |                   | 3       |

*Abstract of the Results of the Hourly Meteorological Observations  
taken at the Surveyor General's Office, Calcutta,  
in the month of July, 1859.*

Latitude 22° 33' 1" North. Longitude 88° 20' 34" East.

Feet.  
Height of the Cistern of the Standard Barometer above the Sea level, 18.11

Daily Means, &c. of the Observations and of the Hygrometrical elements  
dependent thereon.

| Date. | Mean Height of<br>the Barometer<br>at 32° Fahr. | Range of the Barometer<br>during the day. |         |         | Mean Dry Bulb<br>Thermometer. | Range of the Tempera-<br>ture during the day. |      |       |
|-------|-------------------------------------------------|-------------------------------------------|---------|---------|-------------------------------|-----------------------------------------------|------|-------|
|       |                                                 | Max.                                      | Min.    | Diff.   |                               | Max.                                          | Min. | Diff. |
|       | Inches.                                         | Inches.                                   | Inches. | Inches. | °                             | °                                             | °    | °     |
| 1     | 29.625                                          | 29.693                                    | 29.584  | 0.109   | 85.8                          | 90.0                                          | 82.4 | 7.6   |
| 2     | .678                                            | .723                                      | .627    | .096    | 84.7                          | 90.0                                          | 79.6 | 10.4  |
| 3     | Sunday.                                         |                                           |         |         |                               |                                               |      |       |
| 4     | .699                                            | .744                                      | .647    | .097    | 85.8                          | 91.2                                          | 82.0 | 9.2   |
| 5     | .688                                            | .751                                      | .642    | .109    | 85.4                          | 91.8                                          | 81.8 | 10.0  |
| 6     | .616                                            | .677                                      | .547    | .130    | 87.3                          | 94.0                                          | 81.8 | 12.2  |
| 7     | .581                                            | .648                                      | .526    | .122    | 86.5                          | 93.8                                          | 79.6 | 14.2  |
| 8     | .549                                            | .588                                      | .498    | .090    | 88.5                          | 94.1                                          | 84.4 | 9.7   |
| 9     | .602                                            | .667                                      | .532    | .135    | 88.1                          | 94.0                                          | 83.4 | 10.6  |
| 10    | Sunday.                                         |                                           |         |         |                               |                                               |      |       |
| 11    | .685                                            | .722                                      | .622    | .100    | 87.0                          | 93.2                                          | 82.9 | 10.3  |
| 12    | .716                                            | .762                                      | .651    | .111    | 87.0                          | 93.4                                          | 82.2 | 11.2  |
| 13    | .703                                            | .747                                      | .638    | .109    | 86.8                          | 93.6                                          | 82.4 | 11.2  |
| 14    | .683                                            | .736                                      | .625    | .111    | 86.7                          | 92.0                                          | 83.0 | 9.0   |
| 15    | .646                                            | .699                                      | .582    | .117    | 86.0                          | 92.2                                          | 82.2 | 10.0  |
| 16    | .590                                            | .633                                      | .524    | .109    | 85.8                          | 93.8                                          | 82.2 | 11.6  |
| 17    | Sunday.                                         |                                           |         |         |                               |                                               |      |       |
| 18    | .487                                            | .548                                      | .407    | .141    | 87.6                          | 94.8                                          | 82.4 | 12.4  |
| 19    | .424                                            | .485                                      | .341    | .144    | 84.9                          | 89.4                                          | 82.0 | 7.4   |
| 20    | .396                                            | .464                                      | .348    | .116    | 84.0                          | 88.2                                          | 80.9 | 7.3   |
| 21    | 3.98                                            | .452                                      | .322    | .130    | 83.1                          | 89.5                                          | 80.8 | 8.7   |
| 22    | .461                                            | .515                                      | .403    | .112    | 83.4                          | 91.4                                          | 80.1 | 11.3  |
| 23    | .464                                            | .512                                      | .402    | .110    | 83.6                          | 89.8                                          | 80.2 | 9.6   |
| 24    | Sunday.                                         |                                           |         |         |                               |                                               |      |       |
| 25    | .262                                            | .339                                      | .158    | .181    | 85.0                          | 91.6                                          | 81.0 | 10.6  |
| 26    | .154                                            | .257                                      | .012    | .245    | 81.1                          | 85.8                                          | 77.8 | 8.0   |
| 27    | .113                                            | .446                                      | 28.721  | .725    | 80.4                          | 83.8                                          | 78.0 | 5.8   |
| 28    | .490                                            | .552                                      | 29.451  | .101    | 83.7                          | 87.8                                          | 80.1 | 7.7   |
| 29    | .536                                            | .581                                      | .481    | .100    | 85.7                          | 92.0                                          | 81.4 | 10.6  |
| 30    | .533                                            | .586                                      | .465    | .121    | 85.9                          | 90.9                                          | 82.6 | 8.3   |
| 31    | Sunday.                                         |                                           |         |         |                               |                                               |      |       |

The Mean height of the Barometer, as likewise the Mean Dry and Wet Bulb Thermometers are derived from the twenty-four hourly observations made during the day.

*Abstract of the Results of the Hourly Meteorological Observations  
taken at the Surveyor General's Office, Calcutta,  
in the month of July, 1859.*

Daily Means, &c. of the Observations and of the Hygrometrical elements  
dependent thereon.—(Continued.)

| Date. | Mean Wet Bulb Ther-<br>mometer. | Dry Bulb above Wet. | Computed Dew Point. | Dry Bulb above Dew<br>Point. | Mean Elastic force of<br>Vapour. | Mean Weight of Vapour<br>in a cubic foot of air. | Additional Weight of Va-<br>pour required for com-<br>plete saturation. | Mean degree of Humi-<br>dity, complete satura-<br>tion being unity. |
|-------|---------------------------------|---------------------|---------------------|------------------------------|----------------------------------|--------------------------------------------------|-------------------------------------------------------------------------|---------------------------------------------------------------------|
| 1     | 81.4                            | 4.4                 | 79.2                | 6.6                          | 0.976                            | 10.41                                            | 2.42                                                                    | .81                                                                 |
| 2     | 81.1                            | 3.6                 | 79.3                | 5.4                          | .979                             | .48                                              | 1.94                                                                    | .84                                                                 |
| 3     | Sunday.                         |                     |                     |                              |                                  |                                                  |                                                                         |                                                                     |
| 4     | 81.5                            | 4.3                 | 79.3                | 6.5                          | .979                             | .44                                              | 2.39                                                                    | .81                                                                 |
| 5     | 81.3                            | 4.1                 | 79.2                | 6.2                          | .976                             | .43                                              | .25                                                                     | .82                                                                 |
| 6     | 83.2                            | 4.1                 | 81.1                | 6.2                          | 1.037                            | 11.04                                            | .37                                                                     | .82                                                                 |
| 7     | 82.0                            | 4.5                 | 79.7                | 6.8                          | 0.992                            | 10.57                                            | .53                                                                     | .81                                                                 |
| 8     | 84.4                            | 4.1                 | 82.3                | 6.2                          | 1.077                            | 11.44                                            | .44                                                                     | .82                                                                 |
| 9     | 83.9                            | 4.2                 | 81.8                | 6.3                          | .060                             | .26                                              | .46                                                                     | .82                                                                 |
| 10    | Sunday.                         |                     |                     |                              |                                  |                                                  |                                                                         |                                                                     |
| 11    | 81.3                            | 5.7                 | 78.4                | 8.6                          | 0.952                            | 10.12                                            | 3.17                                                                    | .76                                                                 |
| 12    | 81.1                            | 5.9                 | 78.1                | 8.9                          | .943                             | .04                                              | .25                                                                     | .76                                                                 |
| 13    | 81.4                            | 5.4                 | 78.7                | 8.1                          | .961                             | .24                                              | 2.97                                                                    | .78                                                                 |
| 14    | 81.1                            | 5.6                 | 78.3                | 8.4                          | .949                             | .12                                              | 3.06                                                                    | .77                                                                 |
| 15    | 81.5                            | 4.5                 | 79.2                | 6.8                          | .976                             | .41                                              | 2.50                                                                    | .81                                                                 |
| 16    | 81.5                            | 4.3                 | 79.3                | 6.5                          | .979                             | .44                                              | .39                                                                     | .81                                                                 |
| 17    | Sunday.                         |                     |                     |                              |                                  |                                                  |                                                                         |                                                                     |
| 18    | 81.6                            | 6.0                 | 78.6                | 9.0                          | .958                             | .19                                              | 3.33                                                                    | .75                                                                 |
| 19    | 81.4                            | 3.5                 | 79.6                | 5.3                          | .989                             | .58                                              | 1.91                                                                    | .85                                                                 |
| 20    | 81.3                            | 2.7                 | 79.9                | 4.1                          | .998                             | .69                                              | .48                                                                     | .88                                                                 |
| 21    | 80.6                            | 2.5                 | 79.3                | 3.8                          | .979                             | .51                                              | .35                                                                     | .89                                                                 |
| 22    | 80.5                            | 2.9                 | 79.0                | 4.4                          | .970                             | .42                                              | .54                                                                     | .87                                                                 |
| 23    | 81.0                            | 2.6                 | 79.7                | 3.9                          | .992                             | .63                                              | .40                                                                     | .88                                                                 |
| 24    | Sunday.                         |                     |                     |                              |                                  |                                                  |                                                                         |                                                                     |
| 25    | 81.1                            | 3.9                 | 79.1                | 5.9                          | .973                             | .40                                              | 2.13                                                                    | .83                                                                 |
| 26    | 78.2                            | 2.9                 | 76.7                | 4.4                          | .902                             | 9.72                                             | 1.45                                                                    | .87                                                                 |
| 27    | 78.2                            | 2.2                 | 77.1                | 3.3                          | .913                             | .86                                              | .08                                                                     | .90                                                                 |
| 28    | 80.9                            | 2.8                 | 79.5                | 4.2                          | .986                             | 10.57                                            | .50                                                                     | .88                                                                 |
| 29    | 82.3                            | 3.4                 | 80.6                | 5.1                          | 1.021                            | .90                                              | .90                                                                     | .85                                                                 |
| 30    | 81.8                            | 4.1                 | 79.7                | 6.2                          | 0.992                            | .59                                              | 2.28                                                                    | .82                                                                 |
| 31    | Sunday.                         |                     |                     |                              |                                  |                                                  |                                                                         |                                                                     |

All the Hygrometrical elements are computed by the Greenwich Constants.

*Abstract of the Results of the Hourly Meteorological Observations  
taken at the Surveyor General's Office, Calcutta,  
in the month of July, 1859.*

Hourly Means, &c. of the Observations and of the Hygrometrical elements  
dependent thereon.

| Hour.          | Mean Height of<br>the Barometer<br>at 32° Faht. | Range of the Barometer<br>for each hour during<br>the month. |         |         | Mean Dry Bulb<br>Thermometer. | Range of the Temperature<br>for each hour during<br>the month. |      |       |
|----------------|-------------------------------------------------|--------------------------------------------------------------|---------|---------|-------------------------------|----------------------------------------------------------------|------|-------|
|                |                                                 | Max.                                                         | Min.    | Diff.   |                               | Max.                                                           | Min. | Diff. |
|                | Inches.                                         | Inches.                                                      | Inches. | Inches. | o                             | o                                                              | o    | o     |
| Mid-<br>night. | 29.543                                          | 29.726                                                       | 28.933  | 0.793   | 82.9                          | 85.6                                                           | 78.2 | 7.4   |
| 1              | .518                                            | .723                                                         | .866    | .857    | 82.8                          | 85.0                                                           | 78.8 | 6.2   |
| 2              | .513                                            | .719                                                         | .816    | .903    | 82.5                          | 85.2                                                           | 78.8 | 6.4   |
| 3              | .502                                            | .704                                                         | .726    | .978    | 82.2                          | 85.0                                                           | 78.8 | 6.2   |
| 4              | .499                                            | .698                                                         | .721    | .977    | 82.1                          | 84.7                                                           | 78.8 | 5.9   |
| 5              | .516                                            | .708                                                         | .749    | .959    | 82.0                          | 84.6                                                           | 78.8 | 5.8   |
| 6              | .531                                            | .728                                                         | .796    | .932    | 82.0                          | 84.4                                                           | 78.0 | 6.4   |
| 7              | .546                                            | .737                                                         | .870    | .867    | 82.7                          | 85.0                                                           | 78.6 | 6.4   |
| 8              | .563                                            | .754                                                         | .969    | .785    | 84.4                          | 86.6                                                           | 78.0 | 8.6   |
| 9              | .572                                            | .758                                                         | 29.064  | .694    | 85.9                          | 88.4                                                           | 78.4 | 10.0  |
| 10             | .572                                            | .762                                                         | .140    | .622    | 87.7                          | 91.0                                                           | 78.6 | 12.4  |
| 11             | .564                                            | .760                                                         | .183    | .577    | 89.1                          | 92.2                                                           | 79.2 | 13.0  |
| Noon.          | .553                                            | .745                                                         | .177    | .568    | 89.6                          | 93.2                                                           | 80.9 | 12.3  |
| 1              | .536                                            | .723                                                         | .156    | .567    | 90.1                          | 94.0                                                           | 80.6 | 13.4  |
| 2              | .518                                            | .710                                                         | .140    | .570    | 90.3                          | 94.1                                                           | 82.8 | 11.3  |
| 3              | .499                                            | .680                                                         | .126    | .554    | 89.6                          | 94.8                                                           | 82.2 | 12.6  |
| 4              | .478                                            | .651                                                         | .100    | .551    | 88.3                          | 93.6                                                           | 81.2 | 12.4  |
| 5              | .482                                            | .670                                                         | .069    | .601    | 87.4                          | 92.1                                                           | 79.9 | 12.2  |
| 6              | .495                                            | .685                                                         | .063    | .622    | 86.4                          | 90.4                                                           | 80.4 | 10.0  |
| 7              | .513                                            | .700                                                         | .064    | .636    | 85.2                          | 89.2                                                           | 79.5 | 9.7   |
| 8              | .533                                            | .718                                                         | .069    | .649    | 84.4                          | 88.2                                                           | 78.9 | 9.3   |
| 9              | .554                                            | .737                                                         | .082    | .655    | 84.0                          | 87.4                                                           | 77.8 | 9.6   |
| 10             | .559                                            | .740                                                         | .040    | .700    | 83.6                          | 86.6                                                           | 78.8 | 7.8   |
| 11             | .555                                            | .738                                                         | .012    | .726    | 83.3                          | 86.8                                                           | 78.8 | 8.0   |

The Mean Height of the Barometer, as likewise the Mean Dry and Wet Bulb Thermometers are derived from the observations made at the several hours during the month.

*Abstract of the Results of the Hourly Meteorological Observations  
taken at the Surveyor General's Office, Calcutta,  
in the month of July, 1859.*

Hourly Means, &c. of the Observations and of the Hygrometrical elements  
dependent thereon.—(Continued.)

| Hour.          | Mean Wet Bulb<br>Thermometer. | Dry Bulb above Wet. | Computed Dew point. | Dry Bulb above Dew<br>point. | Mean elastic force of<br>Vapour. | Mean Weight of Va-<br>pour in a Cubic foot<br>of Air. | Additional weight of<br>vapour required for<br>complete saturation. | Mean degree of hu-<br>midity, complete satu-<br>ration being unity. |
|----------------|-------------------------------|---------------------|---------------------|------------------------------|----------------------------------|-------------------------------------------------------|---------------------------------------------------------------------|---------------------------------------------------------------------|
|                | o                             | o                   | o                   | o                            | Inches.                          | Troy grs.                                             | Troy grs.                                                           |                                                                     |
| Mid-<br>night. | 80.5                          | 2.4                 | 79.3                | 3.6                          | 0.979                            | 10.51                                                 | 1.28                                                                | 0.89                                                                |
| 1              | 80.4                          | 2.4                 | 79.2                | 3.6                          | .976                             | .48                                                   | .27                                                                 | .89                                                                 |
| 2              | 80.3                          | 2.2                 | 79.2                | 3.3                          | .976                             | .50                                                   | .14                                                                 | .90                                                                 |
| 3              | 80.0                          | 2.2                 | 78.9                | 3.3                          | .967                             | .41                                                   | .13                                                                 | .90                                                                 |
| 4              | 80.0                          | 2.1                 | 78.9                | 3.2                          | .967                             | .41                                                   | .10                                                                 | .90                                                                 |
| 5              | 80.0                          | 2.0                 | 79.0                | 3.0                          | .970                             | .44                                                   | .03                                                                 | .91                                                                 |
| 6              | 80.0                          | 2.0                 | 79.0                | 3.0                          | .970                             | .44                                                   | .03                                                                 | .91                                                                 |
| 7              | 80.4                          | 2.3                 | 79.2                | 3.5                          | .976                             | .48                                                   | .24                                                                 | .89                                                                 |
| 8              | 81.0                          | 3.4                 | 79.3                | 5.1                          | .979                             | .48                                                   | .83                                                                 | .85                                                                 |
| 9              | 81.6                          | 4.3                 | 79.4                | 6.5                          | .983                             | .47                                                   | 2.40                                                                | .81                                                                 |
| 10             | 82.3                          | 5.4                 | 79.6                | 8.1                          | .989                             | .52                                                   | 3.04                                                                | .78                                                                 |
| 11             | 82.8                          | 6.3                 | 79.6                | 9.5                          | .989                             | .48                                                   | .64                                                                 | .74                                                                 |
| Noon.          | 83.0                          | 6.6                 | 79.7                | 9.9                          | .992                             | .51                                                   | .82                                                                 | .73                                                                 |
| 1              | 83.0                          | 7.1                 | 79.4                | 10.7                         | .983                             | .39                                                   | 4.15                                                                | .72                                                                 |
| 2              | 83.3                          | 7.0                 | 79.8                | 10.5                         | .995                             | .51                                                   | .12                                                                 | .72                                                                 |
| 3              | 82.9                          | 6.7                 | 79.5                | 10.1                         | .986                             | .45                                                   | 3.88                                                                | .73                                                                 |
| 4              | 82.6                          | 5.7                 | 79.7                | 8.6                          | .992                             | .53                                                   | .27                                                                 | .76                                                                 |
| 5              | 82.2                          | 5.2                 | 79.6                | 7.8                          | .989                             | .52                                                   | 2.93                                                                | .78                                                                 |
| 6              | 81.7                          | 4.7                 | 79.3                | 7.1                          | .979                             | .44                                                   | .62                                                                 | .80                                                                 |
| 7              | 81.4                          | 3.8                 | 79.5                | 5.7                          | .986                             | .53                                                   | .08                                                                 | .84                                                                 |
| 8              | 81.1                          | 3.3                 | 79.4                | 5.0                          | .983                             | .51                                                   | 1.80                                                                | .85                                                                 |
| 9              | 80.7                          | 3.3                 | 79.0                | 5.0                          | .970                             | .40                                                   | .77                                                                 | .86                                                                 |
| 10             | 80.7                          | 2.9                 | 79.2                | 4.4                          | .976                             | .48                                                   | .55                                                                 | .87                                                                 |
| 11             | 80.7                          | 2.6                 | 79.4                | 3.9                          | .983                             | .54                                                   | .39                                                                 | .88                                                                 |

All the Hygrometrical elements are computed by the Greenwich constants.



*Abstract of the Results of the Hourly Meteorological Observations  
taken at the Surveyor General's Office, Calcutta,  
in the month of July, 1859.*

Solar Radiation, Weather, &c.

| Date. | Max. Solar radiation. | Rain Gauge 5 feet above Ground. | Prevailing direction of the Wind. | General Aspect of the Sky.                                                                         |
|-------|-----------------------|---------------------------------|-----------------------------------|----------------------------------------------------------------------------------------------------|
| 1     | o                     | Inches.                         | S.                                | Cloudless till 4 A. M. Scatd. clouds afterwards.                                                   |
| 2     | ..                    | 0.26                            | S. & E.                           | Cloudy; also drizzling between 2 and 3 A. M. & also at 7 & 9 P. M.                                 |
| 3     | <i>Sunday.</i>        |                                 |                                   |                                                                                                    |
| 4     | 120.0                 | ..                              | S. & S. W.                        | Cloudless till 3 A. M. Scatd. clouds till 8 P. M. cloudless afterwards.                            |
| 5     | 118.0                 | ..                              | S. & S. W.                        | Cloudless till 2 A. M. Scatd. ☉ till 1 P. M. cloudy afterwards, also drizzling between 6 & 8 P. M. |
| 6     | 125.0                 | ..                              | S. & S. E.                        | Scatd. ☾ & ☾-i till 8 A. M. Scatd. ☉ afterwards.                                                   |
| 7     | 127.4                 | 0.12                            | S.                                | Cloudy till 4 A. M. Scatd. ☾-i afterwards; also raining at Midnight.                               |
| 8     | ..                    | ..                              | S. & calm.                        | Cloudy.                                                                                            |
| 9     | 122.0                 | ..                              | S.                                | Cloudless till 3 A. M. Scatd. clouds afterwards; also slightly drizzling between 7 & 8 P. M.       |
| 10    | <i>Sunday.</i>        |                                 |                                   |                                                                                                    |
| 11    | 131.9                 | ..                              | S. & S. W.                        | Clouds of various kinds till 7 P. M. cloudless afterwards.                                         |
| 12    | 122.5                 | ..                              | S. & S. W.                        | Cloudless till 4 A. M. Scatd. clouds afterwards.                                                   |
| 13    | 121.0                 | ..                              | S.                                | Cloudless till 7 A. M. cloudy afterwards.                                                          |
| 14    | 125.0                 | ..                              | S.                                | Cloudy; also very slightly drizzling at 5 A. M.                                                    |
| 15    | ..                    | 0.28                            | S.                                | Cloudy; also drizzling at 3 & 5 P. M.                                                              |
| 16    | 127.0                 | ..                              | S. & S. W.                        | Scatd. ☾ & ☾-i till 7 A. M. Scatd. ☉ afterwards.                                                   |
| 17    | <i>Sunday.</i>        |                                 |                                   |                                                                                                    |
| 18    | 134.0                 | ..                              | N. E. & E.                        | Cloudy.                                                                                            |
| 19    | ..                    | 0.11                            | N. E. & E.                        | Cloudy; also raining at Noon & 5 P. M.                                                             |
| 20    | ..                    | 1.40                            | E. & S. E. & S.                   | Cloudy; also constantly raining or drizzling.                                                      |
| 21    | ..                    | 0.35                            | E. & N. E. & S. E.                | Cloudy; also constantly raining between 1 & 6 P. M.                                                |
| 22    | ..                    | 1.05                            | S. E. & E.                        | Cloudy: also constantly raining, with two or three loud peals of thunder at 3 P. M.                |
| 23    | ..                    | 0.48                            | E. & N. E. & S. E.                | Cloudy; and constantly raining in the afternoon.                                                   |
| 24    | <i>Sunday.</i>        |                                 |                                   |                                                                                                    |
| 25    | ..                    | 0.79                            | N. & S. E.                        | Cloudy; also raining after intervals with much lightning between 8 & 11 P. M.                      |

☾ Cirri, ☾-i cirro strati, ☉ cumuli, ☾-i cumulo strati, ☾-i nimbi, —i strati, ☾i cirro cumuli.

*Abstract of the Results of the Hourly Meteorological Observations  
taken at the Surveyor General's Office, Calcutta,  
in the month of July, 1859.*

Solar Radiation, Weather, &c.

| Date. | Max. Solar radiation. | Rain Gauge<br>5 feet above<br>Ground. | Prevailing direction<br>of the Wind. | General Aspect of the Sky.                                                           |
|-------|-----------------------|---------------------------------------|--------------------------------------|--------------------------------------------------------------------------------------|
|       | 0                     | Inches.                               |                                      |                                                                                      |
| 26    | ..                    | } 4.04                                | N. & N. E.                           | Cloudy; high wind & constant rain from 10 A. M. till Midnight.                       |
| 27    | ..                    |                                       | N. E. & S. & E.                      | Cloudy; also constantly raining between Midnight & 1 P. M.                           |
| 28    | ..                    | 0.21                                  | S. & E.                              | Cloudy; also occasionally raining.                                                   |
| 29    | 128.4                 | ..                                    | S. & S. E.                           | Scatd. $\curvearrowright$ i & $\curvearrowleft$ i till 7 P. M. cloudless afterwards. |
| 30    | 116.5                 | ..                                    | W. & calm.                           | Cloudless till 4 A. M. Scatd. $\curvearrowleft$ i till 2 P. M. cloudy afterwards.    |
| 31    | Sunday.               |                                       |                                      |                                                                                      |

*Abstract of the Results of the Hourly Meteorological Observations  
taken at the Surveyor General's Office, Calcutta,  
in the month of July, 1859.*

MONTHLY RESULTS.

|                                                                         |    |    | Inches.      |
|-------------------------------------------------------------------------|----|----|--------------|
| Mean height of the Barometer for the month,                             | .. | .. | 29.530       |
| Max. height of the Barometer, occurred at 10 A. M. on the 12th,         | .. | .. | 29.762       |
| Min. height of the Barometer, occurred at 4 A. M. on the 27th,          | .. | .. | 28.721       |
| Extreme Range of the Barometer during the month,                        | .. | .. | 1.041        |
| Mean of the Daily Max. Pressures,                                       | .. | .. | 29.597       |
| Ditto ditto Min. ditto,                                                 | .. | .. | 29.452       |
| Mean daily range of the Barometer during the month,                     | .. | .. | 0.145        |
| <hr/>                                                                   |    |    |              |
| Mean Dry Bulb Thermometer for the month,                                | .. | .. | 85.4         |
| Max. Temperature occurred at 3 P. M. on the 18th,                       | .. | .. | 94.8         |
| Min. Temperature occurred at 9 P. M. on the 26th.                       | .. | .. | 77.8         |
| Extreme range of the Temperature during the month,                      | .. | .. | 17.0         |
| Mean of the daily Max. Temperatures,                                    | .. | .. | 91.2         |
| Ditto ditto Min. ditto,                                                 | .. | .. | 81.4         |
| Mean daily range of the Temperatures during the month,                  | .. | .. | 9.8          |
| <hr/>                                                                   |    |    |              |
| Mean Wet Bulb Thermometer for the month,                                | .. | .. | 81.4         |
| Mean Dry Bulb Thermometer above Mean Wet Bulb Thermometer,              | .. | .. | 4.0          |
| Computed Mean Dew Point for the month,                                  | .. | .. | 79.4         |
| Mean Dry Bulb Thermometer above computed Mean Dew Point,                | .. | .. | 6.0          |
|                                                                         |    |    | Inches.      |
| Mean Elastic force of vapour for the month,                             | .. | .. | 0.983        |
| <hr/>                                                                   |    |    |              |
|                                                                         |    |    | Troy grains. |
| Mean weight of vapour for the month,                                    | .. | .. | 10.49        |
| Additional weight of vapour required for complete saturation,           | .. | .. | 2.19         |
| Mean degree of humidity for the month, complete saturation being unity, | .. | .. | 0.83         |
| <hr/>                                                                   |    |    |              |
|                                                                         |    |    | Inches.      |
| Rained 15 days.—Max. fall of rain during 24 hours,                      | .. | .. | 4.04         |
| Total amount of rain during the month,                                  | .. | .. | 9.09         |
| Prevailing direction of the Wind,                                       | .. | .. | S. & S. E.   |

On the 26th July, a high Northerly wind sprung up about 10 A. M. and continued to blow till 5 P. M.; after which, a North Easterly wind set in, and blew for about 3 hours. About 8 P. M. the wind veered and became Easterly, which rose to a gale; the directions of which during several hours of its continuance, were as follows:

From 8 P. M. till Midnight, .. .. . Easterly.

From Midnight till 1 A. M. on the 27th July, .. .. . Northerly.

From 1 A. M. till 8 A. M. .. .. . North Easterly.

At 8 A. M. the gale ceased.

During the prevalence of the gale there was incessant rain, but no thunder and lightning.

The Ten Minutes' observations taken during the gale, show that at 8 P. M. which was the commencement of the gale; the Barometer stood at 29.069 inches, it then continuously descended till it became 28.719 inches at 3. h. 40 m. A. M. After which, the Barometer began to ascend attaining to the height of 28.870 inches at 7 A. M. The Ten Minutes' observations were given up at this hour; but the Barometer was observed to rise continuously (without indicating the usual tides) till the Midnight of the 28th at which time, the height it stood at, was 29.453 inches.

*Abstract of the Results of the Hourly Meteorological Observations  
taken at the Surveyor General's Office, Calcutta,  
in the month of July, 1859.*

### MONTHLY RESULTS.

Table showing the number of days on which at a given hour any particular wind blew, together with the number of days on which at the same hour, when any particular wind was blowing, it rained.

[illegible]

*Abstract of the Results of the Hourly Meteorological Observations  
taken at the Surveyor General's Office, Calcutta,  
in the month of August, 1859.*

Latitude 22° 33' 1" North. Longitude 88° 20' 34" East.

Height of the Cistern of the Standard Barometer above the Sea level, 18.11 feet.

Daily Means, &c. of the Observations and of the Hygrometrical elements  
dependent thereon.

| Date. | Mean Height of<br>the Barometer<br>at 32° Fahr. | Range of the Barometer<br>during the day. |         |         | Mean Dry Bulb<br>Thermometer. | Range of the Tempera-<br>ture during the day. |      |       |
|-------|-------------------------------------------------|-------------------------------------------|---------|---------|-------------------------------|-----------------------------------------------|------|-------|
|       |                                                 | Max.                                      | Min.    | Diff.   |                               | Max.                                          | Min. | Diff. |
|       | Inches.                                         | Inches.                                   | Inches. | Inches. | o                             | o                                             | o    | o     |
| 1     | 29.558                                          | 29.631                                    | 29.491  | 0.140   | 81.1                          | 87.4                                          | 77.0 | 10.4  |
| 2     | .644                                            | .701                                      | .580    | .121    | 82.3                          | 87.6                                          | 77.8 | 9.8   |
| 3     | .670                                            | .718                                      | .629    | .089    | 82.8                          | 86.2                                          | 79.8 | 6.4   |
| 4     | .664                                            | .726                                      | .612    | .114    | 80.9                          | 83.4                                          | 79.3 | 4.1   |
| 5     | .701                                            | .757                                      | .652    | .105    | 81.9                          | 84.6                                          | 79.8 | 4.8   |
| 6     | .702                                            | .751                                      | .643    | .108    | 83.3                          | 88.8                                          | 79.9 | 8.9   |
| 7     | <i>Sunday.</i>                                  |                                           |         |         |                               |                                               |      |       |
| 8     | .807                                            | .860                                      | .727    | .133    | 80.6                          | 86.6                                          | 76.2 | 10.4  |
| 9     | .748                                            | .810                                      | .676    | .134    | 82.3                          | 90.0                                          | 78.4 | 11.6  |
| 10    | .731                                            | .780                                      | .655    | .125    | 83.3                          | 88.5                                          | 79.6 | 8.9   |
| 11    | .668                                            | .717                                      | .592    | .125    | 82.4                          | 87.6                                          | 79.9 | 7.7   |
| 12    | .673                                            | .739                                      | .611    | .128    | 81.2                          | 86.1                                          | 79.0 | 7.1   |
| 13    | .720                                            | .777                                      | .660    | .117    | 82.2                          | 87.8                                          | 78.4 | 9.4   |
| 14    | <i>Sunday.</i>                                  |                                           |         |         |                               |                                               |      |       |
| 15    | .699                                            | .761                                      | .629    | .132    | 84.7                          | 89.6                                          | 80.3 | 9.3   |
| 16    | .645                                            | .698                                      | .560    | .138    | 85.0                          | 90.6                                          | 81.6 | 9.0   |
| 17    | .613                                            | .667                                      | .531    | .136    | 83.3                          | 88.0                                          | 79.4 | 8.6   |
| 18    | .617                                            | .694                                      | .560    | .134    | 83.0                          | 86.6                                          | 80.0 | 6.6   |
| 19    | .683                                            | .749                                      | .628    | .121    | 84.1                          | 89.6                                          | 80.0 | 9.6   |
| 20    | .729                                            | .780                                      | .671    | .109    | 82.3                          | 86.4                                          | 81.0 | 5.4   |
| 21    | <i>Sunday.</i>                                  |                                           |         |         |                               |                                               |      |       |
| 22    | .662                                            | .703                                      | .607    | .096    | 82.7                          | 90.0                                          | 80.2 | 9.8   |
| 23    | .634                                            | .701                                      | .563    | .138    | 83.3                          | 88.8                                          | 80.4 | 8.4   |
| 24    | .639                                            | .701                                      | .572    | .129    | 82.8                          | 86.8                                          | 79.8 | 7.0   |
| 25    | .627                                            | .684                                      | .560    | .124    | 83.5                          | 88.2                                          | 80.0 | 8.2   |
| 26    | .598                                            | .641                                      | .541    | .100    | 81.7                          | 85.3                                          | 79.6 | 5.7   |
| 27    | .596                                            | .634                                      | .538    | .096    | 80.0                          | 82.2                                          | 78.0 | 4.2   |
| 28    | <i>Sunday.</i>                                  |                                           |         |         |                               |                                               |      |       |
| 29    | .504                                            | .553                                      | .434    | .119    | 81.5                          | 85.8                                          | 78.6 | 7.2   |
| 30    | .537                                            | .600                                      | .491    | .109    | 83.2                          | 87.8                                          | 78.6 | 9.2   |
| 31    | .536                                            | .600                                      | .462    | .138    | 85.1                          | 89.6                                          | 81.3 | 8.3   |

The Mean height of the Barometer, as likewise the Mean Dry and Wet Bulb Thermometers are derived from the twenty-four hourly observations made during the day.

*Abstract of the Results of the Hourly Meteorological Observations  
taken at the Surveyor General's Office, Calcutta,  
in the month of August, 1859.*

Daily Means, &c. of the Observations and of the Hygrometrical elements  
dependent thereon.—(Continued.)

| Date. | Mean Wet Bulb Thermo-<br>meter. | Dry Bulb above Wet. | Computed Dew Point. | Dry Bulb above Dew<br>Point. | Mean Elastic force of<br>Vapour. | Mean Weight of Vapour<br>in a cubic foot of Air. | Additional Weight of Va-<br>pour required for com-<br>plete saturation. | Mean degree of Humidity,<br>complete saturation be-<br>ing unity. |
|-------|---------------------------------|---------------------|---------------------|------------------------------|----------------------------------|--------------------------------------------------|-------------------------------------------------------------------------|-------------------------------------------------------------------|
|       | °                               | °                   | °                   | °                            | Inches.                          | T. gr.                                           | T. gr.                                                                  |                                                                   |
| 1     | 78.7                            | 2.4                 | 77.5                | 3.6                          | .925                             | 9.96                                             | 1.21                                                                    | .89                                                               |
| 2     | 79.3                            | 3.0                 | 77.8                | 4.5                          | .934                             | 10.03                                            | .55                                                                     | .87                                                               |
| 3     | 79.6                            | 3.2                 | 78.0                | 4.8                          | .940                             | .09                                              | .66                                                                     | .86                                                               |
| 4     | 78.6                            | 2.3                 | 77.4                | 3.5                          | .922                             | 9.93                                             | .17                                                                     | .90                                                               |
| 5     | 78.6                            | 3.3                 | 76.9                | 5.0                          | .908                             | .76                                              | .68                                                                     | .85                                                               |
| 6     | 79.5                            | 3.8                 | 77.6                | 5.7                          | .928                             | .95                                              | .98                                                                     | .83                                                               |
| 7     | <i>Sunday.</i>                  |                     |                     |                              |                                  |                                                  |                                                                         |                                                                   |
| 8     | 78.4                            | 2.2                 | 77.3                | 3.3                          | .919                             | .92                                              | .09                                                                     | .90                                                               |
| 9     | 78.9                            | 3.4                 | 77.2                | 5.1                          | .916                             | .85                                              | .73                                                                     | .85                                                               |
| 10    | 79.9                            | 3.4                 | 78.2                | 5.1                          | .946                             | 10.15                                            | .78                                                                     | .85                                                               |
| 11    | 80.1                            | 2.3                 | 78.9                | 3.5                          | .967                             | .39                                              | .22                                                                     | .90                                                               |
| 12    | 79.2                            | 2.0                 | 78.2                | 3.0                          | .946                             | .19                                              | .02                                                                     | .91                                                               |
| 13    | 79.3                            | 2.9                 | 77.8                | 4.4                          | .934                             | .05                                              | .49                                                                     | .87                                                               |
| 14    | <i>Sunday.</i>                  |                     |                     |                              |                                  |                                                  |                                                                         |                                                                   |
| 15    | 80.8                            | 3.9                 | 78.8                | 5.9                          | .964                             | .31                                              | 2.11                                                                    | .83                                                               |
| 16    | 81.0                            | 4.0                 | 79.0                | 6.0                          | .970                             | .37                                              | .16                                                                     | .83                                                               |
| 17    | 80.0                            | 3.3                 | 78.3                | 5.0                          | .949                             | .18                                              | 1.75                                                                    | .85                                                               |
| 18    | 80.2                            | 2.8                 | 78.8                | 4.2                          | .964                             | .36                                              | .46                                                                     | .88                                                               |
| 19    | 80.5                            | 3.6                 | 78.7                | 5.4                          | .961                             | .31                                              | .90                                                                     | .84                                                               |
| 20    | 80.2                            | 2.1                 | 79.1                | 3.2                          | .973                             | .47                                              | .11                                                                     | .90                                                               |
| 21    | <i>Sunday.</i>                  |                     |                     |                              |                                  |                                                  |                                                                         |                                                                   |
| 22    | 80.4                            | 2.3                 | 79.2                | 3.5                          | .976                             | .48                                              | .24                                                                     | .89                                                               |
| 23    | 80.7                            | 2.6                 | 79.4                | 3.9                          | .983                             | .54                                              | .39                                                                     | .88                                                               |
| 24    | 80.2                            | 2.6                 | 78.9                | 3.9                          | .967                             | .39                                              | .36                                                                     | .88                                                               |
| 25    | 80.4                            | 3.1                 | 78.8                | 4.7                          | .964                             | .34                                              | .66                                                                     | .86                                                               |
| 26    | 79.7                            | 2.0                 | 78.7                | 3.0                          | .961                             | .35                                              | .02                                                                     | .91                                                               |
| 27    | 78.4                            | 1.6                 | 77.6                | 2.4                          | .928                             | .03                                              | 0.78                                                                    | .93                                                               |
| 28    | <i>Sunday.</i>                  |                     |                     |                              |                                  |                                                  |                                                                         |                                                                   |
| 29    | 79.1                            | 2.4                 | 77.9                | 3.6                          | .937                             | .08                                              | 1.23                                                                    | .89                                                               |
| 30    | 79.8                            | 3.4                 | 78.1                | 5.1                          | .943                             | .12                                              | .77                                                                     | .85                                                               |
| 31    | 81.2                            | 3.9                 | 79.2                | 5.9                          | .976                             | .43                                              | 2.14                                                                    | .83                                                               |

All the Hygrometrical elements are computed by the Greenwich constants.

*Abstract of the Results of the Hourly Meteorological Observations  
taken at the Surveyor General's Office, Calcutta,  
in the month of August, 1859.*

Hourly Means, &c. of the Observations and of the Hygrometrical elements  
dependent thereon.

| Hour.          | Mean Height of<br>the Barometer<br>at 32° Fahr. | Range of the Barometer for<br>each hour during the<br>month. |         |         | Mean Dry Bulb<br>Thermometer. | Range of the Tempera-<br>ture for each hour<br>during the<br>month. |      |       |
|----------------|-------------------------------------------------|--------------------------------------------------------------|---------|---------|-------------------------------|---------------------------------------------------------------------|------|-------|
|                |                                                 | Max.                                                         | Min.    | Diff.   |                               | Max.                                                                | Min. | Diff. |
|                | Inches.                                         | Inches.                                                      | Inches. | Inches. | o                             | o                                                                   | o    | o     |
| Mid-<br>night. | 29.670                                          | 29.819                                                       | 29.523  | 0.296   | 80.8                          | 82.6                                                                | 76.2 | 6.4   |
| 1              | .657                                            | .809                                                         | .514    | .295    | 80.6                          | 82.5                                                                | 76.6 | 5.9   |
| 2              | .647                                            | .792                                                         | .509    | .283    | 80.3                          | 82.4                                                                | 76.6 | 5.8   |
| 3              | .628                                            | .741                                                         | .500    | .241    | 80.2                          | 82.2                                                                | 78.2 | 4.0   |
| 4              | .628                                            | .796                                                         | .491    | .305    | 79.8                          | 81.8                                                                | 77.0 | 4.8   |
| 5              | .642                                            | .802                                                         | .493    | .309    | 79.7                          | 81.6                                                                | 77.0 | 4.6   |
| 6              | .660                                            | .815                                                         | .511    | .304    | 79.6                          | 81.6                                                                | 77.2 | 4.4   |
| 7              | .674                                            | .838                                                         | .522    | .316    | 80.3                          | 82.4                                                                | 77.6 | 4.8   |
| 8              | .692                                            | .854                                                         | .530    | .324    | 81.7                          | 84.2                                                                | 78.8 | 5.4   |
| 9              | .700                                            | .853                                                         | .539    | .314    | 83.2                          | 86.2                                                                | 79.8 | 6.4   |
| 10             | .700                                            | .860                                                         | .541    | .319    | 84.5                          | 87.6                                                                | 79.8 | 7.8   |
| 11             | .689                                            | .848                                                         | .522    | .326    | 85.6                          | 88.0                                                                | 80.0 | 8.0   |
| Noon.          | .674                                            | .828                                                         | .517    | .311    | 85.9                          | 90.0                                                                | 80.0 | 10.0  |
| 1              | .654                                            | .799                                                         | .498    | .301    | 85.7                          | 89.6                                                                | 80.4 | 9.2   |
| 2              | .629                                            | .777                                                         | .469    | .308    | 85.5                          | 89.8                                                                | 81.3 | 8.5   |
| 3              | .608                                            | .740                                                         | .444    | .296    | 85.6                          | 90.6                                                                | 81.2 | 9.4   |
| 4              | .587                                            | .679                                                         | .434    | .245    | 85.4                          | 89.6                                                                | 80.9 | 8.7   |
| 5              | .593                                            | .727                                                         | .441    | .286    | 84.7                          | 88.6                                                                | 81.5 | 7.1   |
| 6              | .604                                            | .737                                                         | .457    | .280    | 83.5                          | 87.2                                                                | 80.0 | 7.2   |
| 7              | .622                                            | .785                                                         | .470    | .315    | 82.8                          | 86.0                                                                | 79.6 | 6.4   |
| 8              | .647                                            | .804                                                         | .509    | .295    | 82.1                          | 85.4                                                                | 79.2 | 6.2   |
| 9              | .666                                            | .823                                                         | .530    | .293    | 81.9                          | 85.2                                                                | 78.6 | 6.6   |
| 10             | .682                                            | .834                                                         | .536    | .298    | 81.6                          | 84.8                                                                | 79.2 | 5.6   |
| 11             | .681                                            | .804                                                         | .528    | .276    | 81.3                          | 84.0                                                                | 79.2 | 4.8   |

The Mean height of the Barometer, as likewise the Mean Dry and Wet Bulb Thermometers are derived from the observations made at the several hours during the month.

*Abstract of the Results of the Hourly Meteorological Observations  
taken at the Surveyor General's Office, Calcutta,  
in the month of August, 1859.*

Hourly Means, &c. of the Observations and of the Hygrometrical elements  
dependent thereon.—(Continued.)

| Hour.          | Mean Wet Bulb Ther-<br>mometer. | Dry Bulb above Wet. | Computed Dew Point. | Dry Bulb above Dew<br>Point. | Mean Elastic Force<br>of Vapour. | Mean Weight of Va-<br>pour in a cubic<br>foot of Air. | Additional Weight of<br>Vapour required<br>for complete satu-<br>ration. | Mean degree of Hu-<br>midity, complete<br>saturation being<br>unity. |
|----------------|---------------------------------|---------------------|---------------------|------------------------------|----------------------------------|-------------------------------------------------------|--------------------------------------------------------------------------|----------------------------------------------------------------------|
|                | o                               | o                   | o                   | o                            | Inches.                          | T. gr.                                                | T. gr.                                                                   |                                                                      |
| Mid-<br>night. | 79.1                            | 1.7                 | 78.2                | 2.6                          | 0.946                            | 10.19                                                 | 0.88                                                                     | 0.92                                                                 |
| 1              | 78.9                            | 1.7                 | 78.0                | 2.6                          | .940                             | .13                                                   | .88                                                                      | .92                                                                  |
| 2              | 78.8                            | 1.5                 | 78.0                | 2.3                          | .940                             | .15                                                   | .76                                                                      | .93                                                                  |
| 3              | 78.6                            | 1.6                 | 77.8                | 2.4                          | .934                             | .09                                                   | .79                                                                      | .93                                                                  |
| 4              | 78.2                            | 1.6                 | 77.4                | 2.4                          | .922                             | 9.97                                                  | .78                                                                      | .93                                                                  |
| 5              | 78.2                            | 1.5                 | 77.4                | 2.3                          | .922                             | .97                                                   | .75                                                                      | .93                                                                  |
| 6              | 78.0                            | 1.6                 | 77.2                | 2.4                          | .916                             | .91                                                   | .78                                                                      | .93                                                                  |
| 7              | 78.5                            | 1.8                 | 77.6                | 2.7                          | .928                             | 10.01                                                 | .90                                                                      | .92                                                                  |
| 8              | 79.2                            | 2.5                 | 77.9                | 3.8                          | .937                             | .08                                                   | 1.29                                                                     | .89                                                                  |
| 9              | 80.0                            | 3.2                 | 78.4                | 4.8                          | .952                             | .21                                                   | .68                                                                      | .86                                                                  |
| 10             | 80.5                            | 4.0                 | 78.5                | 6.0                          | .955                             | .23                                                   | 2.12                                                                     | .83                                                                  |
| 11             | 81.1                            | 4.5                 | 78.8                | 6.8                          | .964                             | .29                                                   | .47                                                                      | .81                                                                  |
|                |                                 |                     |                     |                              |                                  |                                                       |                                                                          |                                                                      |
| Noon.          | 81.2                            | 4.7                 | 78.8                | 7.1                          | .964                             | .29                                                   | .58                                                                      | .80                                                                  |
| 1              | 81.0                            | 4.7                 | 78.6                | 7.1                          | .958                             | .23                                                   | .57                                                                      | .80                                                                  |
| 2              | 80.8                            | 4.7                 | 78.4                | 7.1                          | .952                             | .17                                                   | .55                                                                      | .80                                                                  |
| 3              | 81.1                            | 4.5                 | 78.8                | 6.8                          | .964                             | .29                                                   | .47                                                                      | .81                                                                  |
| 4              | 80.9                            | 4.5                 | 78.6                | 6.8                          | .958                             | .23                                                   | .45                                                                      | .81                                                                  |
| 5              | 80.8                            | 3.9                 | 78.8                | 5.9                          | .964                             | .31                                                   | .11                                                                      | .83                                                                  |
| 6              | 80.3                            | 3.2                 | 78.7                | 4.8                          | .961                             | .31                                                   | 1.69                                                                     | .86                                                                  |
| 7              | 80.0                            | 2.8                 | 78.6                | 4.2                          | .958                             | .30                                                   | .45                                                                      | .88                                                                  |
| 8              | 79.7                            | 2.4                 | 78.5                | 3.6                          | .955                             | .27                                                   | .24                                                                      | .89                                                                  |
| 9              | 79.6                            | 2.3                 | 78.4                | 3.5                          | .952                             | .23                                                   | .21                                                                      | .89                                                                  |
| 10             | 79.5                            | 2.1                 | 78.4                | 3.2                          | .952                             | .25                                                   | .09                                                                      | .90                                                                  |
| 11             | 79.3                            | 2.0                 | 78.3                | 3.0                          | .949                             | .22                                                   | .02                                                                      | .91                                                                  |

All the Hygrometrical elements are computed by the Greenwich constants.



*Abstract of the Results of the Hourly Meteorological Observations  
taken at the Surveyor General's Office, Calcutta,  
in the month of August, 1859.  
Solar Radiation, Weather, &c.*

| Date. | Max. Solar radiation. | Rain Gauge 5 feet above Ground. | Prevailing direction of the Wind. | General Aspect of the Sky.                                                                        |
|-------|-----------------------|---------------------------------|-----------------------------------|---------------------------------------------------------------------------------------------------|
|       | °                     | Inches.<br>*                    |                                   |                                                                                                   |
| 1     | ..                    | 11.56                           | S. W. & S.                        | Cloudy ; also constantly raining.                                                                 |
| 2     | ..                    | 1.70                            | S. & S. W.                        | Cloudy ; also constantly raining.                                                                 |
| 3     | ..                    | 0.14                            | S. & S. E. & S. W.                | Cloudy ; also drizzling in the morning & raining between 9 & 11 P. M.                             |
| 4     | ..                    | 0.46                            | S.                                | Cloudy ; also constantly drizzling.                                                               |
| 5     | ..                    | 0.32                            | S. & S. W.                        | Cloudy ; also drizzling very slightly at 11 A. M.                                                 |
| 6     | 119.6                 | ..                              | S. W. & S.                        | Cloudy till 7 A. M. Scatd. ☾i till 2 P. M. cloudy afterwards ; also drizzling between 6 & 8 P. M. |
| 7     | Sunday.               | 0.74                            |                                   |                                                                                                   |
| 8     | ..                    | 0.14                            | S.                                | Cloudy ; also occasionally drizzling.                                                             |
| 9     | 135.0                 | 0.32                            | S. & S. W. & W.                   | Cloudy ; also raining between 6 & 7 P. M.                                                         |
| 10    | ..                    | ..                              | S. W. & S.                        | Cloudy ; also very slightly drizzling between 10 & 11 P. M.                                       |
| 11    | ..                    | 0.70                            | W.                                | Cloudy with heavy rain at 1 & 3 P. M. ; also slightly drizzling now and then.                     |
| 12    | ..                    | 0.38                            | S. W. & S.                        | Cloudy with occasional drizzling.                                                                 |
| 13    | 125.0                 | ..                              | S. & S. E.                        | Cloudy with occasional drizzling.                                                                 |
| 14    | Sunday.               | 0.12                            |                                   |                                                                                                   |
| 15    | 121.5                 | ..                              | S.                                | Clouds of various kinds till 6 P. M. cloudless afterwards.                                        |
| 16    | 135.0                 | ..                              | S. & S. W.                        | Scatd. clouds.                                                                                    |
| 17    | ..                    | ..                              | S. & S. E.                        | Cloudy ; also very slightly drizzled between 9 & 10 P. M.                                         |
| 18    | ..                    | 0.40                            | S.                                | Cloudy, with rain at Noon & 6 P. M.                                                               |
| 19    | 125.4                 | ..                              | S. & S. E. & N. E.                | Scatd. clouds, with slight drizzling at 2 & 11 P. M.                                              |
| 20    | ..                    | 1.57                            | S. & N. E. & S. E.                | Cloudy, with drizzling between Mid-night & 2 A. M. & also raining between 2 & 4 P. M.             |
| 21    | Sunday.               |                                 |                                   |                                                                                                   |
| 22    | ..                    | 0.46                            | S. & S. E. & E.                   | Cloudy till 6 P. M. cloudless afterwards ; also raining between Noon & 3 P. M.                    |
| 23    | ..                    | ..                              | S. E. & E.                        | Cloudy till 7 P. M. cloudless afterwards ; also slightly drizzling at Noon & 2 P. M.              |

☼i Cirri, ☾i Cirro strati, ☼i Cumuli, ☼i Cumulo strati, ☾i Nimbi, —i Strati  
☼i Cirro cumuli.

\* Fallen on the 31st July and 1st August till 8 A. M.

*Abstract of the Results of the Hourly Meteorological Observations  
taken at the Surveyor General's Office, Calcutta,  
in the month of August, 1859.*

Solar Radiation, Weather, &c.

| Date. | Max Solar radiation. | Rain Gauge 5 feet above Ground. | Prevailing direction of the Wind. | General Aspect of the Sky.                                                    |
|-------|----------------------|---------------------------------|-----------------------------------|-------------------------------------------------------------------------------|
|       | o                    | Inches.                         |                                   |                                                                               |
| 24    | ..                   | 0.48                            | S. E.                             | Cloudy till 7 P. M. cloudless afterwards ; also raining at Midnight & 7 A. M. |
| 25    | 122.0                | ..                              | E. & N. E.                        | Cloudy, with slight drizzling at 1 & 3 A. M.                                  |
| 26    | ..                   | 0.40                            | E. & S. E.                        | Cloudy; also drizzling after intervals in the afternoon.                      |
| 27    | ..                   | 0.36                            | E. & S.                           | Cloudy, with constant drizzling in the forenoon.                              |
| 28    | <i>Sunday.</i>       | 0.48                            |                                   |                                                                               |
| 29    | ..                   | 0.12                            | E.                                | Scatd. — i till 5 A. M. cloudy afterwards with drizzling at 1 & 5 & 8 P. M.   |
| 30    | 122.5                | 0.37                            | S. & S. E.                        | Cloudy, with rain between 3 & 5 A. M. and slight drizzling at 7 P. M.         |
| 31    | ..                   | ..                              | S. W. & S. & calm.                | Scatd. clouds of various kinds.                                               |

*Abstract of the Results of the Hourly Meteorological Observations  
taken at the Surveyor General's Office, Calcutta,  
in the month of August, 1859.*

MONTHLY RESULTS.

|                                                               |    |    | Inches |
|---------------------------------------------------------------|----|----|--------|
| Mean height of the Barometer for the month,                   | .. | .. | 29.652 |
| Max. height of the Barometer occurred at 10 A. M. on the 8th, | .. | .. | 29.860 |
| Min. height of the Barometer occurred at 4 P. M. on the 29th, | .. | .. | 29.434 |
| Extreme range of the Barometer during the month,              | .. | .. | 0.426  |
| Mean of the daily Max. Pressures,                             | .. | .. | 29.709 |
| Ditto ditto Min. ditto,                                       | .. | .. | 29.588 |
| Mean daily range of the Barometers during the month,          | .. | .. | 0.121  |

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|                                                       |    |    | °    |
|-------------------------------------------------------|----|----|------|
| Mean Dry Bulb Thermometer for the month,              | .. | .. | 82.6 |
| Max. Temperature occurred at 3 P. M. on the 16th,     | .. | .. | 90.6 |
| Min. Temperature occurred at Midnight on the 8th,     | .. | .. | 76.2 |
| Extreme range of the Temperature during the month,    | .. | .. | 14.4 |
| Mean of the daily Max. Temperatures,                  | .. | .. | 87.4 |
| Ditto ditto Min. ditto,                               | .. | .. | 79.4 |
| Mean daily range of the Temperature during the month, | .. | .. | 8.0  |

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|                                                            |    |    | °      |
|------------------------------------------------------------|----|----|--------|
| Mean Wet Bulb Thermometer for the month,                   | .. | .. | 79.7   |
| Mean Dry Bulb Thermometer above Mean Wet Bulb Thermometer, | .. | .. | 2.9    |
| Computed Mean Dew-point for the month,                     | .. | .. | 78.2   |
| Mean Dry Bulb Thermometer above computed Mean Dew-point,   | .. | .. | 4.4    |
|                                                            |    |    | Inches |
| Mean Elastic force of Vapour for the month,                | .. | .. | 0.946  |

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|                                                                         |    |    | Troy grains |
|-------------------------------------------------------------------------|----|----|-------------|
| Mean Weight of Vapour for the month,                                    | .. | .. | 10.17       |
| Additional Weight of Vapour required for complete saturation,           | .. | .. | 1.51        |
| Mean degree of humidity for the month, complete saturation being unity, | .. | .. | 0.87        |

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|                                                    |    |    | Inches    |
|----------------------------------------------------|----|----|-----------|
| Rained 27 days, Max. fall of rain during 24 hours, | .. | .. | 11.56     |
| Total amount of rain during the month,             | .. | .. | 21.22     |
| Prevailing direction of the Wind,                  | .. | .. | S. & S. W |

*Abstract of the Results of the Hourly Meteorological Observations  
taken at the Surveyor General's Office, Calcutta,  
in the month of August, 1859.*

### MONTHLY RESULTS.

Table showing the number of days on which at a given hour any particular wind blew, together with the number of days on which at the same hour when any particular wind was blowing, it rained.

| Hour.     | N. | Rain on.<br>N. E. | Rain on.<br>E. | Rain on.<br>S. E. | S. | Rain on.<br>S. W. | W. | Rain on.<br>N. W. | Rain on.<br>Calm. | Rain on.<br>Missed. |
|-----------|----|-------------------|----------------|-------------------|----|-------------------|----|-------------------|-------------------|---------------------|
| Midnight. |    |                   |                |                   |    |                   |    |                   |                   |                     |
| 1         |    |                   | 2              | 1                 | 3  | 1                 | 2  | 3                 | 1                 | 2                   |
| 2         |    |                   | 3              | 1                 | 3  | 1                 | 3  | 3                 | 1                 | 2                   |
| 3         |    |                   | 3              | 1                 | 4  | 1                 | 2  | 2                 | 1                 | 1                   |
| 4         |    |                   | 4              | 2                 | 6  | 1                 | 1  | 1                 |                   | 1                   |
| 5         |    |                   | 4              | 1                 | 6  |                   | 2  | 1                 |                   |                     |
| 6         |    |                   | 4              |                   | 6  |                   | 1  | 1                 |                   |                     |
| 7         |    |                   | 5              |                   | 3  |                   | 1  | 1                 |                   |                     |
| 8         |    | 2                 | 7              | 1                 | 4  | 2                 | 1  | 1                 |                   |                     |
| 9         |    | 2                 | 7              |                   | 1  |                   | 4  | 2                 |                   |                     |
| 10        | 1  | 4                 | 5              |                   | 2  | 1                 | 7  | 1                 | 1                 |                     |
| 11        | 1  | 4                 | 3              |                   | 3  | 1                 | 5  |                   |                   |                     |
| Noon.     |    | 4                 | 3              | 1                 | 3  | 2                 | 6  | 1                 |                   |                     |
| 1         |    | 4                 | 3              | 2                 | 2  | 1                 | 8  |                   |                   |                     |
| 2         | 1  | 2                 | 2              | 1                 | 3  | 2                 | 7  |                   |                   |                     |
| 3         |    | 3                 | 1              |                   | 5  | 2                 | 10 |                   |                   |                     |
| 4         |    | 2                 | 3              | 1                 | 3  |                   | 9  | 1                 |                   | 2                   |
| 5         |    | 1                 | 4              |                   | 4  | 2                 | 7  |                   | 1                 |                     |
| 6         |    |                   | 2              |                   | 7  | 4                 | 6  |                   |                   |                     |
| 7         |    |                   | 2              |                   | 5  | 2                 | 4  | 1                 |                   |                     |
| 8         |    |                   | 4              | 3                 | 5  | 2                 | 4  |                   | 2                 |                     |
| 9         |    |                   | 4              |                   | 5  | 2                 | 3  |                   | 2                 |                     |
| 10        | 1  | 1                 | 3              |                   | 7  | 1                 | 2  |                   | 1                 |                     |
| 11        | 1  | 1                 | 2              |                   | 7  | 1                 | 3  | 1                 | 1                 | 1                   |

*Abstract of the Results of the Hourly Meteorological Observations  
taken at the Surveyor General's Office, Calcutta,  
in the month of September, 1859.*

Latitude 22° 33' 1" North. Longitude 88° 20' 34" East.

Feet.

Height of the Cistern of the Standard Barometer above the Sea level, 18.11

Daily Means, &c. of the Observations and of the Hygrometrical elements  
dependent thereon.

| Date. | Mean Height of<br>the Barometer<br>at 32° Fahr. | Range of the Barometer<br>during the day. |         |         | Mean Dry Bulb<br>Thermometer. | Range of the Tempera-<br>ture during the day. |      |       |
|-------|-------------------------------------------------|-------------------------------------------|---------|---------|-------------------------------|-----------------------------------------------|------|-------|
|       |                                                 | Max.                                      | Min.    | Diff.   |                               | Max.                                          | Min. | Diff. |
|       | Inches.                                         | Inches.                                   | Inches. | Inches. | °                             | °                                             | °    | °     |
| 1     | 29.540                                          | 29.589                                    | 29.474  | 0.115   | 86.0                          | 90.8                                          | 82.8 | 8.0   |
| 2     | .611                                            | .664                                      | .561    | .103    | 83.9                          | 88.8                                          | 81.6 | 7.2   |
| 3     | .598                                            | .652                                      | .526    | .126    | 82.7                          | 88.0                                          | 80.3 | 7.7   |
| 4     | Sunday.                                         |                                           |         |         |                               |                                               |      |       |
| 5     | .583                                            | .643                                      | .510    | .133    | 83.5                          | 87.6                                          | 80.0 | 7.6   |
| 6     | .585                                            | .634                                      | .527    | .107    | 84.9                          | 90.2                                          | 80.6 | 9.6   |
| 7     | .603                                            | .655                                      | .551    | .104    | 85.4                          | 90.6                                          | 81.8 | 8.8   |
| 8     | .569                                            | .628                                      | .512    | .116    | 85.0                          | 89.8                                          | 82.0 | 7.8   |
| 9     | .544                                            | .598                                      | .489    | .109    | 83.6                          | 90.4                                          | 80.1 | 10.3  |
| 10    | .593                                            | .666                                      | .527    | .139    | 83.8                          | 90.0                                          | 80.4 | 9.6   |
| 11    | Sunday.                                         |                                           |         |         |                               |                                               |      |       |
| 12    | .702                                            | .783                                      | .653    | .130    | 84.4                          | 89.2                                          | 80.3 | 8.9   |
| 13    | .693                                            | .755                                      | .625    | .130    | 86.3                          | 91.6                                          | 81.4 | 10.2  |
| 14    | .656                                            | .712                                      | .589    | .123    | 86.9                          | 92.0                                          | 81.8 | 10.2  |
| 15    | .658                                            | .728                                      | .597    | .131    | 83.1                          | 85.6                                          | 77.6 | 8.0   |
| 16    | .669                                            | .716                                      | .621    | .095    | 79.9                          | 83.4                                          | 77.4 | 6.0   |
| 17    | .682                                            | .741                                      | .620    | .121    | 82.0                          | 86.6                                          | 78.6 | 8.0   |
| 18    | Sunday.                                         |                                           |         |         |                               |                                               |      |       |
| 19    | .742                                            | .799                                      | .695    | .104    | 82.0                          | 87.2                                          | 80.0 | 7.2   |
| 20    | .781                                            | .843                                      | .724    | .119    | 79.2                          | 82.1                                          | 76.0 | 6.1   |
| 21    | .820                                            | .874                                      | .778    | .096    | 81.0                          | 84.4                                          | 79.0 | 5.4   |
| 22    | .829                                            | .896                                      | .775    | .121    | 82.4                          | 87.0                                          | 78.0 | 9.0   |
| 23    | .778                                            | .845                                      | .721    | .124    | 83.3                          | 88.0                                          | 79.4 | 8.6   |
| 24    | .745                                            | .799                                      | .683    | .116    | 85.0                          | 90.0                                          | 78.6 | 11.4  |
| 25    | Sunday.                                         |                                           |         |         |                               |                                               |      |       |
| 26    | .852                                            | .936                                      | .796    | .140    | 86.0                          | 91.8                                          | 82.0 | 9.8   |
| 27    | .840                                            | .907                                      | .768    | .139    | 83.1                          | 87.0                                          | 81.4 | 5.6   |
| 28    | .819                                            | .871                                      | .753    | .118    | 81.9                          | 88.8                                          | 80.0 | 8.8   |
| 29    | .838                                            | .908                                      | .786    | .122    | 82.4                          | 86.8                                          | 79.2 | 7.6   |
| 30    | .864                                            | .938                                      | .800    | .138    | 83.5                          | 90.2                                          | 79.2 | 11.0  |

The Mean height of the Barometer, as likewise the Mean Dry and Wet Bulb Thermometers are derived from the twenty-four hourly observations made during the day.

*Abstract of the Results of the Hourly Meteorological Observations  
taken at the Surveyor General's Office, Calcutta,  
in the month of September, 1859.*

Daily Means, &c. of the Observations and of the Hygrometrical elements  
dependent thereon.—(Continued.)

| Date. | Mean Wet Bulb Ther-<br>mometer. | Dry Bulb above Wet. | Computed Dew Point. | Dry Bulb above Dew<br>Point. | Mean Elastic force of<br>Vapour. | Mean Weight of Vapour<br>in a cubic foot of air. | Additional Weight of Va-<br>pour required for com-<br>plete saturation. | Mean degree of Humi-<br>dity, complete satura-<br>tion being unity. |
|-------|---------------------------------|---------------------|---------------------|------------------------------|----------------------------------|--------------------------------------------------|-------------------------------------------------------------------------|---------------------------------------------------------------------|
|       | o                               | o                   | o                   | o                            | Inches.                          | T. gr.                                           | T. gr.                                                                  |                                                                     |
| 1     | 81.9                            | 4.1                 | 79.8                | 6.2                          | 0.995                            | 10.62                                            | 2.29                                                                    | 0.82                                                                |
| 2     | 80.4                            | 3.5                 | 78.6                | 5.3                          | .958                             | .28                                              | 1.85                                                                    | .85                                                                 |
| 3     | 80.4                            | 2.3                 | 79.2                | 3.5                          | .976                             | .48                                              | .24                                                                     | .89                                                                 |
| 4     | Sunday.                         |                     |                     |                              |                                  |                                                  |                                                                         |                                                                     |
| 5     | 80.7                            | 2.8                 | 79.3                | 4.2                          | .979                             | .51                                              | .49                                                                     | .88                                                                 |
| 6     | 82.0                            | 2.9                 | 80.5                | 4.4                          | 1.017                            | .89                                              | .60                                                                     | .87                                                                 |
| 7     | 82.2                            | 3.2                 | 80.6                | 4.8                          | .021                             | .90                                              | .78                                                                     | .86                                                                 |
| 8     | 82.3                            | 2.7                 | 80.9                | 4.1                          | .030                             | 11.01                                            | .52                                                                     | .88                                                                 |
| 9     | 80.8                            | 2.8                 | 79.4                | 4.2                          | 0.983                            | 10.54                                            | .49                                                                     | .88                                                                 |
| 10    | 80.2                            | 3.6                 | 78.4                | 5.4                          | .952                             | .21                                              | .89                                                                     | .84                                                                 |
| 11    | Sunday.                         |                     |                     |                              |                                  |                                                  |                                                                         |                                                                     |
| 12    | 81.1                            | 3.3                 | 79.4                | 5.0                          | .983                             | .51                                              | .80                                                                     | .85                                                                 |
| 13    | 81.9                            | 4.4                 | 79.7                | 6.6                          | .992                             | .57                                              | 2.45                                                                    | .81                                                                 |
| 14    | 81.9                            | 5.0                 | 79.4                | 7.5                          | .983                             | .45                                              | .80                                                                     | .79                                                                 |
| 15    | 80.3                            | 2.8                 | 78.9                | 4.2                          | .967                             | .39                                              | 1.47                                                                    | .88                                                                 |
| 16    | 77.6                            | 2.3                 | 76.4                | 3.5                          | .893                             | 9.64                                             | .14                                                                     | .89                                                                 |
| 17    | 79.2                            | 2.8                 | 77.8                | 4.2                          | .934                             | 10.05                                            | .42                                                                     | .88                                                                 |
| 18    | Sunday.                         |                     |                     |                              |                                  |                                                  |                                                                         |                                                                     |
| 19    | 79.7                            | 2.3                 | 78.5                | 3.5                          | .955                             | .27                                              | .20                                                                     | .90                                                                 |
| 20    | 77.5                            | 1.7                 | 76.6                | 2.6                          | .899                             | 9.71                                             | 0.85                                                                    | .92                                                                 |
| 21    | 78.9                            | 2.1                 | 77.8                | 3.2                          | .934                             | 10.07                                            | 1.07                                                                    | .90                                                                 |
| 22    | 79.4                            | 3.0                 | 77.9                | 4.5                          | .937                             | .06                                              | .55                                                                     | .87                                                                 |
| 23    | 80.1                            | 3.2                 | 78.5                | 4.8                          | .955                             | .25                                              | .68                                                                     | .86                                                                 |
| 24    | 81.3                            | 3.7                 | 79.4                | 5.6                          | .983                             | .49                                              | 2.04                                                                    | .84                                                                 |
| 25    | Sunday.                         |                     |                     |                              |                                  |                                                  |                                                                         |                                                                     |
| 26    | 82.0                            | 4.0                 | 80.0                | 6.0                          | 1.001                            | .68                                              | .23                                                                     | .83                                                                 |
| 27    | 80.0                            | 3.1                 | 78.4                | 4.7                          | 0.952                            | .21                                              | 1.65                                                                    | .86                                                                 |
| 28    | 79.1                            | 2.8                 | 77.7                | 4.2                          | .931                             | .02                                              | .42                                                                     | .88                                                                 |
| 29    | 79.3                            | 3.1                 | 77.7                | 4.7                          | .931                             | .00                                              | .61                                                                     | .86                                                                 |
| 30    | 79.6                            | 3.9                 | 77.6                | 5.9                          | .928                             | 9.95                                             | 2.05                                                                    | .83                                                                 |

All the Hygrometrical elements are computed by the Greenwich Constants.

*Abstract of the Results of the Hourly Meteorological Observations  
taken at the Surveyor General's Office, Calcutta,  
in the month of September, 1859.*

Hourly Means, &c. of the Observations and of the Hygrometrical elements  
dependent thereon.

| Hour.          | Mean Height of<br>the Barometer<br>at 32° Fahr. | Range of the Barometer<br>for each hour during<br>the month. |         |         | Mean Dry Bulb<br>Thermometer. | Range of the Temperature<br>for each hour during<br>the month. |      |       |
|----------------|-------------------------------------------------|--------------------------------------------------------------|---------|---------|-------------------------------|----------------------------------------------------------------|------|-------|
|                |                                                 | Max.                                                         | Min.    | Diff.   |                               | Max.                                                           | Min. | Diff. |
|                | Inches.                                         | Inches.                                                      | Inches. | Inches. | o                             | o                                                              | o    | o     |
| Mid-<br>night. | 29.705                                          | 29.869                                                       | 29.546  | 0.323   | 81.8                          | 85.4                                                           | 78.4 | 7.0   |
| 1              | .693                                            | .853                                                         | .542    | .311    | 81.5                          | 85.2                                                           | 78.6 | 6.6   |
| 2              | .684                                            | .845                                                         | .524    | .321    | 81.3                          | 85.0                                                           | 78.4 | 6.6   |
| 3              | .679                                            | .851                                                         | .516    | .335    | 81.1                          | 84.8                                                           | 78.0 | 6.8   |
| 4              | .669                                            | .850                                                         | .496    | .354    | 80.8                          | 84.6                                                           | 77.5 | 7.1   |
| 5              | .689                                            | .848                                                         | .514    | .334    | 80.6                          | 83.0                                                           | 76.0 | 7.0   |
| 6              | .702                                            | .856                                                         | .520    | .336    | 80.4                          | 83.0                                                           | 76.5 | 6.5   |
| 7              | .725                                            | .883                                                         | .536    | .347    | 81.2                          | 83.8                                                           | 76.2 | 7.6   |
| 8              | .748                                            | .908                                                         | .565    | .343    | 83.0                          | 85.6                                                           | 76.7 | 8.9   |
| 9              | .760                                            | .938                                                         | .581    | .357    | 84.2                          | 87.2                                                           | 77.0 | 10.2  |
| 10             | .756                                            | .936                                                         | .577    | .359    | 85.4                          | 88.6                                                           | 77.5 | 11.1  |
| 11             | .745                                            | .922                                                         | .567    | .355    | 86.1                          | 90.6                                                           | 78.2 | 12.4  |
| Noon.          | .722                                            | .893                                                         | .547    | .346    | 86.9                          | 91.6                                                           | 79.1 | 12.5  |
| 1              | .699                                            | .864                                                         | .511    | .353    | 87.0                          | 91.8                                                           | 80.5 | 11.3  |
| 2              | .676                                            | .834                                                         | .507    | .327    | 86.8                          | 91.8                                                           | 80.6 | 11.2  |
| 3              | .654                                            | .824                                                         | .482    | .342    | 86.5                          | 92.0                                                           | 81.0 | 11.0  |
| 4              | .646                                            | .817                                                         | .474    | .343    | 86.5                          | 91.6                                                           | 80.6 | 11.0  |
| 5              | .646                                            | .800                                                         | .477    | .323    | 85.3                          | 90.0                                                           | 80.2 | 9.8   |
| 6              | .662                                            | .814                                                         | .506    | .308    | 84.3                          | 88.8                                                           | 80.1 | 8.7   |
| 7              | .677                                            | .843                                                         | .535    | .308    | 83.5                          | 87.8                                                           | 80.0 | 7.8   |
| 8              | .698                                            | .875                                                         | .560    | .315    | 83.0                          | 88.0                                                           | 80.0 | 8.0   |
| 9              | .715                                            | .889                                                         | .562    | .327    | 82.5                          | 86.4                                                           | 78.6 | 7.8   |
| 10             | .725                                            | .900                                                         | .579    | .321    | 82.1                          | 86.0                                                           | 77.7 | 8.3   |
| 11             | .714                                            | .888                                                         | .554    | .334    | 81.7                          | 85.6                                                           | 77.6 | 8.0   |

The Mean Height of the Barometer, as likewise the Mean Dry and Wet Bulb Thermometers are derived from the observations made at the several hours during the month.

*Abstract of the Results of the Hourly Meteorological Observations  
taken at the Surveyor General's Office, Calcutta,  
in the month of September, 1859.*

Hourly Means, &c. of the Observations and of the Hygrometrical elements  
dependent thereon.—(Continued.)

| Hour.          | Mean Wet Bulb<br>Thermometer. | Dry Bulb above Wet. | Computed Dew point. | Dry Bulb above Dew<br>point. | Mean elastic force of<br>Vapour. | Mean Weight of Va-<br>pour in a Cubic foot<br>of Air. | Additional weight of<br>vapour required for<br>complete saturation. | Mean degree of hu-<br>midity, complete satu-<br>ration being unity. |
|----------------|-------------------------------|---------------------|---------------------|------------------------------|----------------------------------|-------------------------------------------------------|---------------------------------------------------------------------|---------------------------------------------------------------------|
|                | o                             | o                   | o                   | o                            | Inches.                          | Troy grs.                                             | Troy grs.                                                           |                                                                     |
| Mid-<br>night. | 79.7                          | 2.1                 | 78.6                | 3.2                          | 0.958                            | 10.32                                                 | 1.08                                                                | 0.91                                                                |
| 1              | 79.6                          | 1.9                 | 78.6                | 2.9                          | .958                             | .32                                                   | 0.99                                                                | .91                                                                 |
| 2              | 79.6                          | 1.7                 | 78.7                | 2.6                          | .961                             | .35                                                   | .89                                                                 | .92                                                                 |
| 3              | 79.3                          | 1.8                 | 78.4                | 2.7                          | .952                             | .25                                                   | .92                                                                 | .92                                                                 |
| 4              | 79.0                          | 1.8                 | 78.1                | 2.7                          | .943                             | .16                                                   | .91                                                                 | .92                                                                 |
| 5              | 79.1                          | 1.5                 | 78.3                | 2.3                          | .949                             | .24                                                   | .77                                                                 | .93                                                                 |
| 6              | 79.0                          | 1.4                 | 78.3                | 2.1                          | .949                             | .24                                                   | .70                                                                 | .94                                                                 |
| 7              | 79.5                          | 1.7                 | 78.6                | 2.6                          | .958                             | .32                                                   | .89                                                                 | .92                                                                 |
| 8              | 80.4                          | 2.6                 | 79.1                | 3.9                          | .973                             | .45                                                   | 1.37                                                                | .88                                                                 |
| 9              | 80.8                          | 3.4                 | 79.1                | 5.1                          | .973                             | .42                                                   | .82                                                                 | .85                                                                 |
| 10             | 81.0                          | 4.4                 | 78.8                | 6.6                          | .964                             | .29                                                   | 2.39                                                                | .81                                                                 |
| 11             | 81.3                          | 4.8                 | 78.9                | 7.2                          | .967                             | .32                                                   | .63                                                                 | .80                                                                 |
|                |                               |                     |                     |                              |                                  |                                                       |                                                                     |                                                                     |
| Noon.          | 81.6                          | 5.3                 | 78.9                | 8.0                          | .967                             | .30                                                   | .95                                                                 | .78                                                                 |
| 1              | 81.7                          | 5.3                 | 79.0                | 8.0                          | .970                             | .33                                                   | .96                                                                 | .78                                                                 |
| 2              | 81.4                          | 5.4                 | 78.7                | 8.1                          | .961                             | .24                                                   | .97                                                                 | .78                                                                 |
| 3              | 81.4                          | 5.1                 | 78.8                | 7.7                          | .964                             | .27                                                   | .83                                                                 | .78                                                                 |
| 4              | 81.5                          | 5.0                 | 79.0                | 7.5                          | .970                             | .33                                                   | .77                                                                 | .79                                                                 |
| 5              | 81.3                          | 4.0                 | 79.3                | 6.0                          | .979                             | .46                                                   | .18                                                                 | .83                                                                 |
| 6              | 80.9                          | 3.4                 | 79.2                | 5.1                          | .976                             | .45                                                   | 1.83                                                                | .85                                                                 |
| 7              | 80.6                          | 2.9                 | 79.1                | 4.4                          | .973                             | .45                                                   | .55                                                                 | .87                                                                 |
| 8              | 80.5                          | 2.5                 | 79.2                | 3.8                          | .976                             | .48                                                   | .34                                                                 | .89                                                                 |
| 9              | 80.1                          | 2.4                 | 78.9                | 3.6                          | .967                             | .39                                                   | .25                                                                 | .89                                                                 |
| 10             | 79.8                          | 2.3                 | 78.6                | 3.5                          | .958                             | .30                                                   | .21                                                                 | .90                                                                 |
| 11             | 79.5                          | 2.2                 | 78.4                | 3.3                          | .952                             | .25                                                   | .12                                                                 | .90                                                                 |

All the Hygrometrical elements are computed by the Greenwich Constants.



*Abstract of the Results of the Hourly Meteorological Observations  
taken at the Surveyor General's Office, Calcutta,  
in the month of September, 1859.*

Solar Radiation, Weather, &c.

| Date. | Max. Solar radiation. | Rain Gauge 5 feet above Ground. | Prevailing direction of the Wind. | General Aspect of the Sky.                                                                           |
|-------|-----------------------|---------------------------------|-----------------------------------|------------------------------------------------------------------------------------------------------|
|       | °                     | Inches.                         |                                   |                                                                                                      |
| 1     | 126.0                 |                                 | Calm & N. E.                      | Cloudy.                                                                                              |
| 2     | 119.0                 | 0.11                            | N. E. & E. & S. E.                | Cloudy, with slight drizzling at 11 A. M. and 2 P. M.                                                |
| 3     | ..                    | 0.72                            | E.                                | Cloudy, with constant drizzling between 6 A. M. and 4 P. M.                                          |
| 4     | <i>Sunday.</i>        |                                 |                                   |                                                                                                      |
| 5     | 123.0                 | 0.56                            | S. E. & E.                        | Cloudy with rain at 3 and 6 P. M.                                                                    |
| 6     | 124.8                 | ..                              | S. E. & S.                        | Scatd. clouds.                                                                                       |
| 7     | 127.0                 | 1.11                            | S.                                | Cloudy, with rain at 8 A. M. and 7 P. M.                                                             |
| 8     | 118.9                 | 0.26                            | S. & S. E. & N. W.                | Scatd. ☾ till 8 A. M. cloudy afterwards, with rain between 10 and 11 A. M.                           |
| 9     | 126.2                 | 0.79                            | N. W. & W.                        | Cloudy, with constant rain between 2 and 8 P. M.                                                     |
| 10    | ..                    | ..                              | W. & S. W.                        | Cloudy and drizzling occasionally.                                                                   |
| 11    | <i>Sunday.</i>        | 1.34                            |                                   |                                                                                                      |
| 12    | ..                    | ..                              | S. & W.                           | Cloudy till 1 P. M. Scatd. ☾ till 8 P. M. cloudless afterwards.                                      |
| 13    | 128.5                 | ..                              | S. W. & S.                        | Cloudless till 8 A. M. Scatd. ☾ and ☾ till 6 P. M. cloudless afterwards.                             |
| 14    | 130.4                 | ..                              | N. E. & S. W.                     | Cloudless till 5 A. M. Scatd. ☾ and ☾ afterwards.                                                    |
| 15    | ..                    | 0.76                            | S. W. & N. W.                     | Cloudy, with rain between 4 and 5 A. M. and also between 8 and 11 P. M.                              |
| 16    | ..                    | 1.16                            | S. W.                             | Cloudy, with rain between 4 and 5 A. M. and also at 9 A. M.                                          |
| 17    | ..                    | 0.16                            | S.                                | Scatd. ☾ and ☾ till 9 A. M. Scatd. ☾ afterwards ; also slightly raining between 11 A. M. and 1 P. M. |
| 18    | <i>Sunday.</i>        |                                 |                                   |                                                                                                      |
| 19    | 135.2                 | 1.26                            | S. & E.                           | Scatd. ☾ till 8 A. M. cloudy afterwards ; also raining at 2 and 5 and 6 P. M.                        |
| 20    | ..                    | 1.96                            | S.                                | Cloudy, with rain from 8 A. M. till Noon.                                                            |
| 21    | ..                    | 0.14                            | S.                                | Cloudy, with slight drizzling at 7 and 10 A. M. and also at 6 P. M.                                  |
| 22    | ..                    | 0.67                            | S.                                | Cloudy till 6 P. M. with rain from 3 A. M. to 7 A. M., cloudless after 6 P. M.                       |
| 23    | 127.6                 | ..                              | S. & S. W.                        | Cloudless till 8 A. M. Scatd. ☾ and ☾ till 9 P. M. cloudless afterwards.                             |
| 24    | 135.3                 | 0.32                            | S. & S. W.                        | Cloudless till 5 A. M. Scatd. clouds afterwards with rain at 10 P. M.                                |

☾ Cirri, ☾ cirro strati, ☾ cumuli, ☾ cumulo strati, ☾ nimbi, ☾ strati, ☾ cirro cumuli.

*Abstract of the Results of the Hourly Meteorological Observations  
taken at the Surveyor General's Office, Calcutta,  
in the month of September, 1859.*

Solar Radiation, Weather, &c.

| Date. | Max. Solar radiation. | Rain Gauge 5 feet above Ground. | Prevailing direction of the Wind. | General Aspect of the Sky.                                                                                                           |
|-------|-----------------------|---------------------------------|-----------------------------------|--------------------------------------------------------------------------------------------------------------------------------------|
|       | o                     | Inches.                         |                                   |                                                                                                                                      |
| 25    | Sunday.               |                                 |                                   |                                                                                                                                      |
| 26    | 142.5                 | ..                              | S.                                | Cloudless till 4 A. M. Scatd. $\searrow$ i and $\nearrow$ i till 6 P. M. cloudless afterwards; also slightly drizzled at Noon.       |
| 27    | ..                    | ..                              | S.                                | Cloudy till 7 P. M. cloudless afterwards; also slightly drizzled between 10 and 11 A. M.                                             |
| 28    | ..                    | ..                              | S. E. & S.                        | Cloudless till 6 A. M. Scatd. $\searrow$ i till 11 A. M. cloudy till 6 P. M., cloudless afterwards, with slight drizzling at 3 P. M. |
| 29    | 127.0                 | 0.23                            | S. & S. E. & E.                   | Cloudless till 7 A. M. Scatd. $\searrow$ i and $\nearrow$ i till 8 P. M. cloudless afterwards; also raining at Noon, 1 and 3 P. M.   |
| 30    | 138.0                 | ..                              | N. E. & E.                        | Cloudless 6 A. M. Scatd. $\nearrow$ i till 6 P. M. cloudless afterwards; also slightly drizzled at 3 P. M.                           |

*Abstract of the Results of the Hourly Meteorological Observations  
taken at the Surveyor General's Office, Calcutta,  
in the month of September, 1859.*

MONTHLY RESULTS.

|                                                                |    |    | Inches. |
|----------------------------------------------------------------|----|----|---------|
| Mean height of the Barometer for the month,                    | .. | .. | 29.699  |
| Max. height of the Barometer, occurred at 9 A. M. on the 30th, | .. | .. | 29.938  |
| Min. height of the Barometer, occurred at 4 P. M. on the 1st,  | .. | .. | 29.474  |
| <i>Extreme Range</i> of the Barometer during the month,        | .. | .. | 0.464   |
| Mean of the Daily Max. Pressures,                              | .. | .. | 29.761  |
| Ditto ditto Min. ditto,                                        | .. | .. | 29.641  |
| <i>Mean daily range</i> of the Barometer during the month,     | .. | .. | 0.120   |

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|                                                               |    |    | o    |
|---------------------------------------------------------------|----|----|------|
| Mean Dry Bulb Thermometer for the month,                      | .. | .. | 83.5 |
| Max. Temperature occurred at 3 P. M. on the 14th,             | .. | .. | 92.0 |
| Min. Temperature occurred at 5 A. M. on the 20th,             | .. | .. | 76.0 |
| <i>Extreme range</i> of the Temperature during the month,     | .. | .. | 16.0 |
| Mean of the daily Max. Temperatures,                          | .. | .. | 88.4 |
| Ditto ditto Min. ditto,                                       | .. | .. | 80.0 |
| <i>Mean daily range</i> of the Temperatures during the month, | .. | .. | 8.4  |

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|                                                            |    |    | o       |
|------------------------------------------------------------|----|----|---------|
| Mean Wet Bulb Thermometer for the month,                   | .. | .. | 80.4    |
| Mean Dry Bulb Thermometer above Mean Wet Bulb Thermometer, | .. | .. | 3.1     |
| Computed Mean Dew Point for the month,                     | .. | .. | 78.8    |
| Mean Dry Bulb Thermometer above computed Mean Dew Point,   | .. | .. | 4.7     |
|                                                            |    |    | Inches. |
| Mean Elastic force of vapour for the month,                | .. | .. | 0.964   |

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|                                                                         |    |    | Troy grains. |
|-------------------------------------------------------------------------|----|----|--------------|
| Mean weight of vapour for the month,                                    | .. | .. | 10.34        |
| Additional weight of vapour required for complete saturation,           | .. | .. | 1.66         |
| Mean degree of humidity for the month, complete saturation being unity, | .. | .. | 0.86         |

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|                                                    |    |    | Inches     |
|----------------------------------------------------|----|----|------------|
| Rained 21 days.—Max. fall of rain during 24 hours, | .. | .. | 1.96       |
| Total amount of rain during the month,             | .. | .. | 11.55      |
| Prevailing direction of the Wind,                  | .. | .. | S. & S. W. |

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in the month of September, 1859.*

## MONTHLY RESULTS.

Table showing the number of days on which at a given hour any particular wind  
blew, together with the number of days on which at the same hour,  
when any particular wind was blowing, it rained.

| Hour.     | N.           | Rain on. | N. E. | Rain on. | E. | Rain on. | S. E. | Rain on. | S. | Rain on. | S. W. | Rain on. | W. | Rain on. | N. W. | Rain on. | Calm. | Rain on. | Missed. |
|-----------|--------------|----------|-------|----------|----|----------|-------|----------|----|----------|-------|----------|----|----------|-------|----------|-------|----------|---------|
|           | No. of days. |          |       |          |    |          |       |          |    |          |       |          |    |          |       |          |       |          |         |
| Midnight. |              |          | 1     |          | 4  |          | 2     |          | 13 |          | 2     |          |    |          | 2     |          | 2     |          |         |
| 1         |              |          | 1     |          | 4  |          | 3     |          | 13 |          | 2     |          |    |          | 2     |          | 1     |          |         |
| 2         |              |          | 1     |          | 4  |          | 3     |          | 13 |          | 2     |          |    |          | 2     |          | 1     |          |         |
| 3         |              |          | 1     |          | 6  |          | 1     |          | 13 | 2        | 2     |          |    |          | 2     |          | 1     |          |         |
| 4         |              |          | 1     |          | 4  |          | 1     |          | 9  | 2        | 4     | 1        |    |          | 2     | 1        | 1     |          | 4       |
| 5         |              |          | 1     |          | 5  |          | 1     |          | 11 | 2        | 5     | 2        |    |          | 2     | 1        | 1     |          |         |
| 6         |              |          | 1     |          | 5  | 1        | 2     |          | 10 | 2        | 6     |          |    |          | 1     |          | 1     |          |         |
| 7         | 1            |          | 3     |          | 3  | 1        | 2     |          | 8  | 3        | 7     |          |    |          | 1     |          | 1     |          |         |
| 8         | 2            |          | 1     |          | 4  |          | 3     | 1        | 6  | 1        | 4     |          | 3  |          | 1     |          |       |          | 2       |
| 9         | 1            |          | 1     |          | 4  |          | 3     |          | 8  | 1        | 4     |          | 4  |          |       |          |       |          | 1       |
| 10        |              |          | 1     |          | 6  |          | 1     |          | 9  | 2        | 4     |          | 4  |          | 1     |          |       |          |         |
| 11        |              |          | 2     |          | 3  | 1        | 3     | 1        | 10 | 1        | 3     |          | 5  |          |       |          |       |          |         |
| Noon.     |              |          | 4     |          | 2  | 1        | 4     | 1        | 7  | 2        | 4     | 1        | 4  |          | 1     |          |       |          |         |
| 1         |              |          | 3     |          | 1  |          | 5     | 1        | 7  |          | 5     | 1        | 5  |          |       |          |       |          |         |
| 2         |              |          | 4     | 1        | 1  | 1        | 5     | 1        | 7  |          | 5     |          | 4  | 1        |       |          |       |          |         |
| 3         |              |          | 2     | 1        | 1  |          | 6     | 3        | 8  |          | 6     |          | 7  |          | 1     |          |       |          |         |
| 4         | 1            |          | 3     | 1        | 1  |          | 3     |          | 9  |          | 7     |          | 1  |          | 1     |          |       |          |         |
| 5         |              |          | 3     |          | 1  |          | 2     |          | 15 | 1        | 3     |          | 2  | 1        |       |          |       |          |         |
| 6         |              |          | 3     |          | 1  |          | 2     | 1        | 15 | 2        | 3     |          | 2  | 2        |       |          |       |          |         |
| 7         | 1            | 1        | 1     |          | 1  |          | 3     |          | 15 | 1        | 3     |          | 1  | 1        |       |          | 1     |          |         |
| 8         |              |          | 1     |          | 1  |          | 3     |          | 15 |          |       |          | 2  |          |       |          | 1     |          |         |
| 9         |              |          | 1     |          |    |          | 3     | 1        | 17 | 2        | 2     |          |    |          | 1     |          | 2     |          |         |
| 10        |              |          | 1     |          |    |          | 3     |          | 17 | 2        | 2     |          |    |          | 2     | 1        | 1     |          |         |
| 11        | 1            |          | 1     |          | 1  |          | 3     |          | 14 | 1        | 2     |          |    |          | 2     |          | 1     |          | 1       |

*Abstract of the Results of the Hourly Meteorological Observations  
taken at the Surveyor General's Office, Calcutta,  
in the month of October, 1859.*

Latitude 22° 33' 1" North. Longitude 88° 20' 34" East.

feet.

Height of the Cistern of the Standard Barometer above the Sea level, 18.11

Daily Means, &c. of the Observations and of the Hygrometrical elements  
dependent thereon.

| Date. | Mean Height of<br>the Barometer<br>at 32° Fahr. | Range of the Barometer<br>during the day. |         |         | Mean Dry Bulb<br>Thermometer. | Range of the Tempera-<br>ture during the day. |      |       |
|-------|-------------------------------------------------|-------------------------------------------|---------|---------|-------------------------------|-----------------------------------------------|------|-------|
|       |                                                 | Max.                                      | Min.    | Diff.   |                               | Max.                                          | Min. | Diff. |
|       | Inches.                                         | Inches.                                   | Inches. | Inches. | °                             | °                                             | °    | °     |
| 1     | 29.837                                          | 29.899                                    | 29.767  | 0.132   | 83.7                          | 89.8                                          | 80.2 | 9.6   |
| 2     | <i>Sunday.</i>                                  |                                           |         |         |                               |                                               |      |       |
| 3     | .702                                            | .771                                      | .641    | .130    | 81.0                          | 85.2                                          | 78.8 | 6.4   |
| 4     | .682                                            | .735                                      | .628    | .107    | 78.7                          | 82.7                                          | 77.6 | 5.1   |
| 5     | .698                                            | .756                                      | .639    | .117    | 80.7                          | 86.4                                          | 77.3 | 9.1   |
| 6     | .677                                            | .722                                      | .600    | .122    | 82.3                          | 88.2                                          | 78.6 | 9.6   |
| 7     | .688                                            | .746                                      | .639    | .107    | 82.8                          | 87.2                                          | 80.1 | 7.1   |
| 8     | .697                                            | .764                                      | .626    | .138    | 82.4                          | 86.6                                          | 79.6 | 7.0   |
| 9     | <i>Sunday.</i>                                  |                                           |         |         |                               |                                               |      |       |
| 10    | .743                                            | .790                                      | .693    | .097    | 81.0                          | 86.0                                          | 78.2 | 7.8   |
| 11    | .767                                            | .825                                      | .718    | .107    | 81.8                          | 86.6                                          | 77.8 | 8.8   |
| 12    | .770                                            | .835                                      | .709    | .126    | 83.0                          | 87.4                                          | 79.4 | 8.0   |
| 13    | .768                                            | .829                                      | .716    | .113    | 82.5                          | 87.2                                          | 78.8 | 8.4   |
| 14    | .781                                            | .850                                      | .720    | .130    | 83.3                          | 87.6                                          | 79.6 | 8.0   |
| 15    | .772                                            | .817                                      | .706    | .111    | 83.1                          | 87.4                                          | 79.8 | 7.6   |
| 16    | <i>Sunday.</i>                                  |                                           |         |         |                               |                                               |      |       |
| 17    | .739                                            | .804                                      | .685    | .119    | 83.6                          | 88.6                                          | 79.6 | 9.0   |
| 18    | .716                                            | .783                                      | .651    | .132    | 83.3                          | 89.3                                          | 78.0 | 11.3  |
| 19    | .682                                            | .746                                      | .625    | .121    | 82.3                          | 87.2                                          | 79.0 | 8.2   |
| 20    | .696                                            | .752                                      | .652    | .100    | 82.0                          | 88.0                                          | 75.6 | 12.4  |
| 21    | .777                                            | .844                                      | .723    | .121    | 81.5                          | 88.6                                          | 76.0 | 12.6  |
| 22    | .845                                            | .914                                      | .801    | .113    | 80.9                          | 88.4                                          | 74.4 | 14.0  |
| 23    | <i>Sunday.</i>                                  |                                           |         |         |                               |                                               |      |       |
| 24    | .889                                            | .958                                      | .838    | .120    | 79.9                          | 87.0                                          | 76.0 | 11.0  |
| 25    | .914                                            | .981                                      | .865    | .116    | 80.8                          | 87.8                                          | 75.2 | 12.6  |
| 26    | .960                                            | 30.021                                    | .915    | .106    | 81.2                          | 87.6                                          | 76.0 | 11.6  |
| 27    | .979                                            | .048                                      | .927    | .121    | 80.2                          | 86.8                                          | 75.0 | 11.8  |
| 28    | .980                                            | .053                                      | .931    | .122    | 79.4                          | 86.6                                          | 74.2 | 12.4  |
| 29    | .968                                            | .039                                      | .926    | .113    | 78.9                          | 86.2                                          | 72.1 | 14.1  |
| 30    | <i>Sunday.</i>                                  |                                           |         |         |                               |                                               |      |       |
| 31    | .967                                            | .027                                      | .915    | .112    | 78.0                          | 87.2                                          | 71.8 | 15.4  |

The Mean height of the Barometer, as likewise the Mean Dry and Wet Bulb Thermometers are derived from the twenty-four hourly observations made during the day.

*Abstract of the Results of the Hourly Meteorological Observations  
taken at the Surveyor General's Office, Calcutta,  
in the month of October, 1859.*

Daily Means, &c. of the Observations and of the Hygrometrical elements  
dependent thereon.—(Continued.)

| Date. | Mean Wet Bulb Thermo-<br>meter. | Dry Bulb above Wet. | Computed Dew Point. | Dry Bulb above Dew<br>Point. | Mean Elastic force of<br>Vapour. | Mean Weight of Vapour<br>in a cubic foot of Air. | Additional Weight of Va-<br>pour required for com-<br>plete saturation. | Mean degree of Humidity,<br>complete saturation be-<br>ing unity. |
|-------|---------------------------------|---------------------|---------------------|------------------------------|----------------------------------|--------------------------------------------------|-------------------------------------------------------------------------|-------------------------------------------------------------------|
|       | °                               | °                   | °                   | °                            | Inches.                          | T. gr.                                           | T. gr.                                                                  |                                                                   |
| 1     | 79.8                            | 3.9                 | 77.8                | 5.9                          | 0.934                            | 10.01                                            | 2.06                                                                    | 0.83                                                              |
| 2     | <i>Sunday.</i>                  |                     |                     |                              |                                  |                                                  |                                                                         |                                                                   |
| 3     | 78.7                            | 2.3                 | 77.5                | 3.5                          | .925                             | 9.96                                             | 1.18                                                                    | .89                                                               |
| 4     | 77.6                            | 1.1                 | 77.0                | 1.7                          | .910                             | .85                                              | 0.56                                                                    | .95                                                               |
| 5     | 78.6                            | 2.1                 | 77.5                | 3.2                          | .925                             | .98                                              | 1.06                                                                    | .90                                                               |
| 6     | 80.0                            | 2.3                 | 78.8                | 3.5                          | .964                             | 10.36                                            | .22                                                                     | .90                                                               |
| 7     | 80.3                            | 2.5                 | 79.0                | 3.8                          | .970                             | .42                                              | .33                                                                     | .89                                                               |
| 8     | 79.8                            | 2.6                 | 78.5                | 3.9                          | .955                             | .27                                              | .34                                                                     | .89                                                               |
| 9     | <i>Sunday.</i>                  |                     |                     |                              |                                  |                                                  |                                                                         |                                                                   |
| 10    | 78.9                            | 2.1                 | 77.8                | 3.2                          | .934                             | .07                                              | .07                                                                     | .90                                                               |
| 11    | 78.5                            | 3.3                 | 76.8                | 5.0                          | .905                             | 9.73                                             | .67                                                                     | .85                                                               |
| 12    | 79.2                            | 3.8                 | 77.3                | 5.7                          | .919                             | .86                                              | .96                                                                     | .83                                                               |
| 13    | 78.6                            | 3.9                 | 76.6                | 5.9                          | .899                             | .65                                              | .99                                                                     | .83                                                               |
| 14    | 79.9                            | 3.4                 | 78.2                | 5.1                          | .946                             | 10.15                                            | .78                                                                     | .85                                                               |
| 15    | 80.2                            | 2.9                 | 78.7                | 4.4                          | .961                             | .33                                              | .53                                                                     | .87                                                               |
| 16    | <i>Sunday.</i>                  |                     |                     |                              |                                  |                                                  |                                                                         |                                                                   |
| 17    | 79.2                            | 4.4                 | 77.0                | 6.6                          | .910                             | 9.75                                             | 2.28                                                                    | .81                                                               |
| 18    | 78.3                            | 5.0                 | 75.8                | 7.5                          | .876                             | .39                                              | .54                                                                     | .79                                                               |
| 19    | 78.1                            | 4.2                 | 76.0                | 6.3                          | .882                             | .48                                              | .10                                                                     | .82                                                               |
| 20    | 76.9                            | 5.1                 | 74.3                | 7.7                          | .835                             | 8.97                                             | .50                                                                     | .78                                                               |
| 21    | 75.3                            | 6.2                 | 72.2                | 9.3                          | .781                             | .40                                              | .91                                                                     | .74                                                               |
| 22    | 73.7                            | 7.2                 | 70.1                | 10.8                         | .729                             | 7.85                                             | 3.25                                                                    | .71                                                               |
| 23    | <i>Sunday.</i>                  |                     |                     |                              |                                  |                                                  |                                                                         |                                                                   |
| 24    | 74.2                            | 5.7                 | 71.3                | 8.6                          | .758                             | 8.18                                             | 2.60                                                                    | .76                                                               |
| 25    | 74.8                            | 6.0                 | 71.8                | 9.0                          | .771                             | .30                                              | .77                                                                     | .75                                                               |
| 26    | 75.0                            | 6.2                 | 71.9                | 9.3                          | .773                             | .33                                              | .88                                                                     | .74                                                               |
| 27    | 74.3                            | 5.9                 | 71.3                | 8.9                          | .758                             | .18                                              | .70                                                                     | .75                                                               |
| 28    | 73.1                            | 6.3                 | 69.9                | 9.5                          | .725                             | 7.82                                             | .80                                                                     | .74                                                               |
| 29    | 72.7                            | 6.2                 | 69.6                | 9.3                          | .717                             | .76                                              | .71                                                                     | .74                                                               |
| 30    | <i>Sunday.</i>                  |                     |                     |                              |                                  |                                                  |                                                                         |                                                                   |
| 31    | 71.3                            | 6.7                 | 67.9                | 10.1                         | .679                             | .36                                              | .83                                                                     | .72                                                               |

All the Hygrometrical elements are computed by the Greenwich constants.

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in the month of October, 1859.*

Hourly Means, &c. of the Observations and of the Hygrometrical elements  
dependent thereon.

| Hour.          | Mean Height of<br>the Barometer<br>at 32° Fahr. | Range of the Barometer for<br>each hour during the<br>month. |         |         | Mean Dry Bulb<br>Thermometer. | Range of the Tempera-<br>ture for each hour<br>during the<br>month. |      |       |
|----------------|-------------------------------------------------|--------------------------------------------------------------|---------|---------|-------------------------------|---------------------------------------------------------------------|------|-------|
|                |                                                 | Max.                                                         | Min.    | Diff.   |                               | Max.                                                                | Min. | Diff. |
|                | Inches.                                         | Inches.                                                      | Inches. | Inches. | o                             | o                                                                   | o    | o     |
| Mid-<br>night. | 29.799                                          | 29.988                                                       | 29.681  | 0.307   | 79.0                          | 81.8                                                                | 74.6 | 7.2   |
| 1              | .788                                            | .965                                                         | .667    | .298    | 78.7                          | 81.6                                                                | 74.0 | 7.6   |
| 2              | .779                                            | .963                                                         | .655    | .308    | 78.4                          | 81.6                                                                | 73.8 | 7.8   |
| 3              | .774                                            | .962                                                         | .628    | .334    | 78.0                          | 81.0                                                                | 73.2 | 7.8   |
| 4              | .771                                            | .960                                                         | .637    | .323    | 77.8                          | 81.0                                                                | 72.3 | 8.7   |
| 5              | .782                                            | .970                                                         | .649    | .321    | 77.8                          | 80.7                                                                | 71.8 | 8.9   |
| 6              | .802                                            | .992                                                         | .657    | .335    | 77.3                          | 80.2                                                                | 71.8 | 8.4   |
| 7              | .823                                            | 30.017                                                       | .687    | .330    | 78.0                          | 81.0                                                                | 72.6 | 8.4   |
| 8              | .849                                            | .037                                                         | .703    | .334    | 80.7                          | 84.0                                                                | 76.8 | 7.2   |
| 9              | .856                                            | .053                                                         | .722    | .331    | 82.2                          | 85.6                                                                | 78.2 | 7.4   |
| 10             | .854                                            | .048                                                         | .716    | .332    | 83.4                          | 86.5                                                                | 79.4 | 7.1   |
| 11             | .836                                            | .027                                                         | .693    | .334    | 84.6                          | 87.6                                                                | 79.2 | 8.4   |
| Noon.          | .810                                            | .002                                                         | .664    | .338    | 85.6                          | 88.6                                                                | 76.8 | 11.8  |
| 1              | .782                                            | 29.981                                                       | .633    | .348    | 86.3                          | 88.8                                                                | 77.2 | 11.6  |
| 2              | .758                                            | .960                                                         | .611    | .349    | 86.3                          | 89.8                                                                | 78.7 | 11.1  |
| 3              | .747                                            | .943                                                         | .607    | .336    | 86.3                          | 89.3                                                                | 78.2 | 11.1  |
| 4              | .742                                            | .932                                                         | .600    | .332    | 85.3                          | 88.3                                                                | 78.7 | 9.6   |
| 5              | .754                                            | .933                                                         | .630    | .303    | 84.3                          | 87.4                                                                | 78.9 | 8.5   |
| 6              | .764                                            | .949                                                         | .639    | .310    | 82.9                          | 85.4                                                                | 78.8 | 6.6   |
| 7              | .784                                            | .976                                                         | .652    | .324    | 81.7                          | 84.2                                                                | 78.0 | 6.2   |
| 8              | .803                                            | .995                                                         | .678    | .317    | 80.9                          | 83.6                                                                | 76.6 | 7.0   |
| 9              | .816                                            | 30.007                                                       | .692    | .315    | 80.2                          | 82.8                                                                | 75.8 | 7.0   |
| 10             | .820                                            | .007                                                         | .692    | .315    | 79.7                          | 82.5                                                                | 75.0 | 7.5   |
| 11             | .808                                            | 29.995                                                       | .691    | .304    | 79.2                          | 82.0                                                                | 73.8 | 8.2   |

The Mean height of the Barometer, as likewise the Mean Dry and Wet Bulb Thermometers are derived from the observations made at the several hours during the month.

*Abstract of the Results of the Hourly Meteorological Observations  
taken at the Surveyor General's Office, Calcutta,  
in the month of October, 1859.*

Hourly Means, &c. of the Observations and of the Hygrometrical elements  
dependent thereon.—(Continued.)

| Hour.          | Mean Wet Bulb Ther-<br>mometer. | Dry Bulb above Wet. | Computed Dew Point. | Dry Bulb above Dew<br>Point. | Mean Elastic Force<br>of Vapour. | Mean Weight of Va-<br>pour in a cubic<br>foot of Air. | Additional Weight of<br>Vapour required<br>for complete satu-<br>ration. | Mean degree of Hu-<br>midity, complete<br>saturation being<br>unity. |
|----------------|---------------------------------|---------------------|---------------------|------------------------------|----------------------------------|-------------------------------------------------------|--------------------------------------------------------------------------|----------------------------------------------------------------------|
|                | o                               | o                   | o                   | o                            | Inches.                          | T. gr.                                                | T. gr.                                                                   |                                                                      |
| Mid-<br>night. | 76.8                            | 2.2                 | 75.7                | 3.3                          | 0.873                            | 9.45                                                  | 1.05                                                                     | 0.90                                                                 |
| 1              | 76.7                            | 2.0                 | 75.7                | 3.0                          | .873                             | .45                                                   | 0.96                                                                     | .91                                                                  |
| 2              | 76.4                            | 2.0                 | 75.4                | 3.0                          | .865                             | .37                                                   | .94                                                                      | .91                                                                  |
| 3              | 76.0                            | 2.0                 | 75.0                | 3.0                          | .854                             | .25                                                   | .94                                                                      | .91                                                                  |
| 4              | 75.9                            | 1.9                 | 74.9                | 2.9                          | .851                             | .22                                                   | .91                                                                      | .91                                                                  |
| 5              | 76.0                            | 1.8                 | 75.1                | 2.7                          | .857                             | .28                                                   | .85                                                                      | .92                                                                  |
| 6              | 75.4                            | 1.9                 | 74.4                | 2.9                          | .838                             | .10                                                   | .88                                                                      | .91                                                                  |
| 7              | 75.9                            | 2.1                 | 74.8                | 3.2                          | .849                             | .20                                                   | .99                                                                      | .90                                                                  |
| 8              | 77.0                            | 3.7                 | 75.1                | 5.6                          | .857                             | .23                                                   | 1.81                                                                     | .84                                                                  |
| 9              | 77.4                            | 4.8                 | 75.0                | 7.2                          | .854                             | .18                                                   | 2.36                                                                     | .80                                                                  |
| 10             | 77.6                            | 5.8                 | 74.7                | 8.7                          | .846                             | .06                                                   | .90                                                                      | .76                                                                  |
| 11             | 77.9                            | 6.7                 | 74.5                | 10.1                         | .840                             | .00                                                   | 3.39                                                                     | .73                                                                  |
|                |                                 |                     |                     |                              |                                  |                                                       |                                                                          |                                                                      |
| Noon.          | 78.1                            | 7.5                 | 74.3                | 11.3                         | .835                             | 8.92                                                  | .84                                                                      | .70                                                                  |
| 1              | 78.2                            | 8.1                 | 74.1                | 12.2                         | .830                             | .85                                                   | 4.17                                                                     | .68                                                                  |
| 2              | 78.2                            | 8.1                 | 74.1                | 12.2                         | .830                             | .85                                                   | .17                                                                      | .68                                                                  |
| 3              | 78.3                            | 8.0                 | 74.3                | 12.0                         | .835                             | .90                                                   | .12                                                                      | .68                                                                  |
| 4              | 77.5                            | 7.8                 | 73.6                | 11.7                         | .817                             | .72                                                   | 3.92                                                                     | .69                                                                  |
| 5              | 77.6                            | 6.7                 | 74.2                | 10.1                         | .832                             | .91                                                   | .37                                                                      | .73                                                                  |
| 6              | 77.9                            | 5.0                 | 75.4                | 7.5                          | .865                             | 9.28                                                  | 2.51                                                                     | .79                                                                  |
| 7              | 78.0                            | 3.7                 | 76.1                | 5.6                          | .885                             | .51                                                   | 1.86                                                                     | .84                                                                  |
| 8              | 77.8                            | 3.1                 | 76.2                | 4.7                          | .887                             | .56                                                   | .54                                                                      | .86                                                                  |
| 9              | 77.5                            | 2.7                 | 76.1                | 4.1                          | .885                             | .55                                                   | .33                                                                      | .88                                                                  |
| 10             | 77.1                            | 2.6                 | 75.8                | 3.9                          | .876                             | .46                                                   | .26                                                                      | .88                                                                  |
| 11             | 76.9                            | 2.3                 | 75.7                | 3.5                          | .873                             | .43                                                   | .13                                                                      | .89                                                                  |

All the Hygrometrical elements are computed by the Greenwich constants.



*Abstract of the Results of the Hourly Meteorological Observations  
taken at the Surveyor General's Office, Calcutta,  
in the month of October, 1859.*

Solar Radiation, Weather, &c.

| Date. | Max. Solar radiation. | Rain Gauge 5 feet above Ground. | Prevailing direction of the Wind. | General Aspect of the Sky.                                                                                           |
|-------|-----------------------|---------------------------------|-----------------------------------|----------------------------------------------------------------------------------------------------------------------|
|       | o                     | Inches.                         |                                   |                                                                                                                      |
| 1     | 139.6                 | 0.16                            | S. & N. E. & E.                   | Cloudless till 7 A. M. Scatd. ☉ till 2 P. M. cloudy till 6 P. M. cloudless afterwards; also drizzling at 3 & 4 P. M. |
| 2     | <i>Sunday.</i>        |                                 |                                   |                                                                                                                      |
| 3     | ..                    | 0.80                            | S. E.                             | Scatd. ☾ till 8 A. M. cloudy afterwards; also drizzling at 9 A. M. & Noon & 5 & 7 P. M.                              |
| 4     | ..                    | 0.79                            | E. & S.                           | Cloudy the whole day with thunder & lightning at 11 P. M.; also rained incessantly between 4 A. M. & 3 P. M.         |
| 5     | ..                    | 1.37                            | S. E. & S. & E.                   | Cloudy; also constantly raining between Midnight & 5 A. M.; also at 1 & 8 & 9 P. M.                                  |
| 6     | ..                    | ..                              | S.                                | Scatd. ☾ & ☾ till 8 A. M. cloudy till 6 P. M. Scatd. ☾ & ☾ afterwards; also slightly drizzled between 1 & 2 P. M.    |
| 7     | 141.7                 | ..                              | S. & N.                           | Cloudy; also drizzled at 6 A. M. & 3 P. M.                                                                           |
| 8     | ..                    | ..                              | N. & N. E.                        | Cloudy the whole day with lightning at 4 A. M.; also drizzled at 10 P. M.                                            |
| 9     | <i>Sunday.</i>        | 1.59                            |                                   |                                                                                                                      |
| 10    |                       | 0.25                            | S. E. & N. E.                     | Cloudy; also raining at 5 & 6 A. M.                                                                                  |
| 11    | 129.3                 | ..                              | N. & N. E.                        | Cloudless till 6 A. M. Scatd. ☾ & ☉ till 9 P. M. cloudless afterwards.                                               |
| 12    | 136.0                 | ..                              | N. & N. W.                        | Scatd. ☾ & ☉ till 5 P. M. cloudless afterwards.                                                                      |
| 13    | 134.0                 | ..                              | N. & N. W. & W.                   | Cloudless till 8 A. M. Scatd. clouds till 6 P. M. cloudless afterwards.                                              |
| 14    | 135.0                 | ..                              | S. W. & W.                        | Scatd. clouds.                                                                                                       |
| 15    | ..                    | ..                              | W.                                | Cloudless till 6 A. M. Scatd. clouds afterwards; also drizzled at 1 P. M.                                            |
| 16    | <i>Sunday.</i>        |                                 |                                   |                                                                                                                      |
| 17    | 138.2                 | ..                              | N. W. & N.                        | Cloudless till 8 A. M. Scatd. ☉ till 5 P. M. cloudless afterwards.                                                   |
| 18    | 140.0                 | ..                              | W. & N.                           | Cloudless till 8 A. M. Scatd. ☾ & ☉ till 6 P. M. cloudless afterwards.                                               |
| 19    | 135.2                 | ..                              | N. & W. & N. W.                   | Cloudless till 6 A. M. Scatd. ☾ & ☉ till 6 P. M. cloudless afterwards.                                               |
| 20    | 140.0                 | ..                              | W.                                | Cloudless till 11 A. M. Scatd. ☉ till 5 P. M. cloudless afterwards.                                                  |

☉ Cirri, ☾ Cirro strati, ☉ Cumuli, ☾ Cumulo strati, ☾ Nimbi, — Strat i ☾ Cirro cumuli.

*Abstract of the Results of the Hourly Meteorological Observations  
taken at the Surveyor General's Office, Calcutta,  
in the month of October, 1859.  
Solar Radiation, Weather, &c.*

| Date. | Max. Solar radiation. | Rain Gauge 5 feet above Ground. | Prevailing direction of the Wind. | General Aspect of the Sky.                                                                              |
|-------|-----------------------|---------------------------------|-----------------------------------|---------------------------------------------------------------------------------------------------------|
|       | o                     | Inches.                         |                                   |                                                                                                         |
| 21    | 143.0                 | ..                              | W.                                | Cloudless.                                                                                              |
| 22    | 140.0                 | ..                              | W. & S. W.                        | Cloudless.                                                                                              |
| 23    | <i>Sunday.</i>        |                                 |                                   |                                                                                                         |
| 24    | 141.0                 | ..                              | N. W. & W.                        | Scatd. $\curvearrowright$ & $\curvearrowleft$ till 6 P. M. cloudless afterwards.                        |
| 25    | 132.5                 | ..                              | W. & E.                           | Scatd. clouds till 7 A. M. cloudless afterwards.                                                        |
| 26    | 144.0                 | ..                              | W. & N. & N. W                    | Scatd. $\curvearrowleft$ till 9 A. M. cloudless till 6 P. M. Scatd. $\curvearrowright$ afterwards.      |
| 27    | 145.0                 | ..                              | W. & N. W. & N.                   | Cloudless till 5 A. M. Scatd. $\curvearrowright$ till 5 P. M. cloudless afterwards.                     |
| 28    | 140.2                 | ..                              | N. & N. W. & W.                   | Cloudless till 5 A. M. Scatd. $\curvearrowright$ till 11 A. M. cloudless afterwards.                    |
| 29    | 144.0                 | ..                              | W. & N. W. & S.                   | Cloudless till 8 A. M. Scatd. $\curvearrowright$ & $\curvearrowleft$ till 4 P. M. cloudless afterwards. |
| 30    | <i>Sunday.</i>        |                                 |                                   |                                                                                                         |
| 31    | 142.2                 | ..                              | W. & S. W.                        | Cloudless.                                                                                              |

*Abstract of the Results of the Hourly Meteorological Observations  
taken at the Surveyor General's Office, Calcutta,  
in the month of October, 1859.*

MONTHLY RESULTS.

|                                                               |    |    | Inches |
|---------------------------------------------------------------|----|----|--------|
| Mean height of the Barometer for the month,                   | .. | .. | 29.796 |
| Max. height of the Barometer occurred at 9 A. M. on the 28th, | .. | .. | 30.053 |
| Min. height of the Barometer occurred at 4 P. M. on the 6th,  | .. | .. | 29.600 |
| <i>Extreme range</i> of the Barometer during the month,       | .. | .. | 0.453  |
| Mean of the daily Max. Pressures,                             | .. | .. | 29.858 |
| Ditto ditto Min. ditto,                                       | .. | .. | 29.741 |
| <i>Mean daily range</i> of the Barometer during the month,    | .. | .. | 0.117  |

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|                                                              |    |    | °    |
|--------------------------------------------------------------|----|----|------|
| Mean Dry Bulb Thermometer for the month,                     | .. | .. | 81.5 |
| Max. Temperature occurred at 2 P. M. on the 1st,             | .. | .. | 89.8 |
| Min. Temperature occurred at 5 & 6 A. M. on the 31st,        | .. | .. | 71.8 |
| <i>Extreme range</i> of the Temperature during the month,    | .. | .. | 18.0 |
| Mean of the daily Max. Temperature,                          | .. | .. | 87.2 |
| Ditto ditto Min. ditto,                                      | .. | .. | 77.3 |
| <i>Mean daily range</i> of the Temperature during the month, | .. | .. | 9.9  |

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|                                                            |    |    | °       |
|------------------------------------------------------------|----|----|---------|
| Mean Wet Bulb Thermometer for the month,                   | .. | .. | 77.2    |
| Mean Dry Bulb Thermometer above Mean Wet Bulb Thermometer, | .. | .. | 4.3     |
| Computed Mean Dew-point for the month,                     | .. | .. | 75.0    |
| Mean Dry Bulb Thermometer above computed Mean Dew-point,   | .. | .. | 6.5     |
|                                                            |    |    | Inches. |
| Mean Elastic force of Vapour for the month,                | .. | .. | 0.854   |

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|                                                                         |    |    | Troy grains. |
|-------------------------------------------------------------------------|----|----|--------------|
| Mean Weight of Vapour for the month,                                    | .. | .. | 9.18         |
| Additional Weight of Vapour required for complete saturation,           | .. | .. | 2.13         |
| Mean degree of humidity for the month, complete saturation being unity, | .. | .. | 0.81         |

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|                                                    |    |    | Inches.         |
|----------------------------------------------------|----|----|-----------------|
| Rained 10 days, Max. fall of rain during 24 hours, | .. | .. | 1.59            |
| Total amount of rain during the month,             | .. | .. | 4.96            |
| Prevailing direction of the Wind,                  | .. | .. | W. & N. & N. W. |

*Abstract of the Results of the Hourly Meteorological Observations  
taken at the Surveyor General's Office, Calcutta,  
in the month of October, 1859.*

MONTHLY RESULTS.

Table showing the number of days on which at a given hour any particular wind blew, together with the number of days on which at the same hour, when any particular wind was blowing, it rained.

| Hour.     | N.           | Rain on.<br>N. | E. | Rain on.<br>E. | S. E. | S. | Rain on.<br>S. | W. | Rain on.<br>W. | N. W. | Rain on.<br>N. W. | Calm. | Rain on.<br>Calm. | Missed. |
|-----------|--------------|----------------|----|----------------|-------|----|----------------|----|----------------|-------|-------------------|-------|-------------------|---------|
|           | No. of days. |                |    |                |       |    |                |    |                |       |                   |       |                   |         |
| Midnight. | 5            | 1              | 3  | 1              | 2     | 3  | 2              | 7  | 3              |       |                   |       |                   |         |
| 1         | 5            | 1              | 3  | 1              | 2     | 3  | 2              | 7  | 3              |       |                   |       |                   |         |
| 2         | 5            | 1              | 3  | 1              | 2     | 3  | 2              | 7  | 3              |       |                   |       |                   |         |
| 3         | 3            | 1              | 4  | 1              | 2     | 2  | 2              | 7  | 3              |       |                   |       |                   | 2       |
| 4         | 4            | 1              | 4  | 2              | 2     | 2  | 2              | 6  | 4              |       |                   |       |                   | 1       |
| 5         | 4            | 1              | 3  | 1              | 2     | 1  | 3              | 6  | 3              |       |                   |       |                   | 2       |
| 6         | 4            | 1              | 2  | 2              | 2     | 1  | 3              | 3  | 7              |       |                   |       |                   |         |
| 7         | 6            |                | 3  | 1              | 2     | 4  | 3              | 4  | 5              |       |                   |       |                   |         |
| 8         | 8            |                | 1  | 1              | 2     | 4  | 1              | 7  | 2              |       |                   |       |                   | 1       |
| 9         | 8            |                | 1  |                | 3     | 1  | 3              | 9  | 2              |       |                   |       |                   |         |
| 10        | 5            |                | 1  |                | 3     | 3  | 1              | 9  | 5              |       |                   |       |                   |         |
| 11        | 6            | 1              | 1  |                | 2     | 4  | 1              | 9  | 2              |       |                   |       |                   |         |
| Noon.     | 7            |                | 1  |                | 2     | 1  | 4              | 8  | 2              |       |                   |       |                   |         |
| 1         | 6            |                | 1  |                | 3     | 1  | 2              | 9  | 4              | 1     |                   |       |                   |         |
| 2         | 8            |                | 1  |                | 3     |    | 2              | 8  | 4              |       |                   |       |                   |         |
| 3         | 7            |                | 1  | 1              | 2     |    | 2              | 9  | 3              |       |                   |       |                   |         |
| 4         | 6            | 1              | 1  |                | 1     | 1  | 3              | 9  | 5              |       |                   |       |                   | 2       |
| 5         | 3            | 2              |    |                | 3     | 1  | 1              | 7  | 6              |       |                   |       |                   | 1       |
| 6         | 4            | 2              |    |                | 3     |    | 2              | 9  | 4              | 1     |                   |       |                   |         |
| 7         | 2            | 3              | 1  |                | 3     | 1  | 2              | 9  | 5              |       |                   |       |                   |         |
| 8         | 2            | 3              | 2  |                | 1     | 1  | 3              | 9  | 5              |       |                   |       |                   |         |
| 9         | 3            | 4              | 2  |                | 1     | 1  | 3              | 6  | 5              | 1     |                   |       |                   |         |
| 10        | 3            | 4              | 2  |                | 1     |    | 3              | 6  | 5              | 1     |                   |       |                   |         |
| 11        | 3            | 4              | 2  |                | 1     |    | 3              | 5  | 5              |       |                   |       |                   | 2       |

*Abstract of the Results of the Hourly Meteorological Observations  
taken at the Surveyor General's Office, Calcutta,  
in the month of November, 1859.*

Latitude 22° 33' 1" North. Longitude 88° 20' 34" East.

Height of the Cistern of the Standard Barometer above the Sea level, 18.11 Feet.

Daily Means, &c. of the Observations and of the Hygrometrical elements  
dependent thereon.

| Date. | Mean Height of<br>the Barometer<br>at 32° Fahr. | Range of the Barometer<br>during the day. |         |         | Mean Dry Bulb<br>Thermometer. | Range of the Tempera-<br>ture during the day. |      |       |
|-------|-------------------------------------------------|-------------------------------------------|---------|---------|-------------------------------|-----------------------------------------------|------|-------|
|       |                                                 | Max.                                      | Min.    | Diff.   |                               | Max.                                          | Min. | Diff. |
|       | Inches.                                         | Inches.                                   | Inches. | Inches. | o                             | o                                             | o    | o     |
| 1     | 29.963                                          | 30.055                                    | 29.894  | 0.161   | 77.6                          | 86.4                                          | 70.4 | 16.0  |
| 2     | .898                                            | 29.970                                    | .839    | .131    | 77.5                          | 85.6                                          | 69.2 | 16.4  |
| 3     | .865                                            | .938                                      | .810    | .128    | 76.3                          | 84.8                                          | 69.2 | 15.6  |
| 4     | .876                                            | .939                                      | .807    | .132    | 77.7                          | 86.6                                          | 70.4 | 16.2  |
| 5     | .953                                            | 30.011                                    | .904    | .107    | 78.8                          | 86.8                                          | 72.4 | 14.4  |
| 6     | <i>Sunday.</i>                                  |                                           |         |         |                               |                                               |      |       |
| 7     | .965                                            | .042                                      | .910    | .132    | 76.1                          | 84.8                                          | 68.6 | 16.2  |
| 8     | .970                                            | .033                                      | .919    | .114    | 76.5                          | 84.2                                          | 69.6 | 14.6  |
| 9     | .996                                            | .070                                      | .944    | .126    | 76.0                          | 82.8                                          | 70.2 | 12.6  |
| 10    | .975                                            | .044                                      | .916    | .128    | 76.5                          | 84.2                                          | 70.6 | 13.6  |
| 11    | .968                                            | .038                                      | .924    | .114    | 76.7                          | 83.6                                          | 72.0 | 11.6  |
| 12    | 30.000                                          | .068                                      | .947    | .121    | 76.5                          | 84.0                                          | 71.4 | 12.6  |
| 13    | <i>Sunday.</i>                                  |                                           |         |         |                               |                                               |      |       |
| 14    | 29.993                                          | .054                                      | .919    | .135    | 74.7                          | 84.5                                          | 68.0 | 16.5  |
| 15    | .993                                            | .067                                      | .938    | .129    | 74.0                          | 83.6                                          | 66.6 | 17.0  |
| 16    | 30.000                                          | .074                                      | .931    | .143    | 74.3                          | 83.8                                          | 66.8 | 17.0  |
| 17    | 29.982                                          | .041                                      | .925    | .116    | 74.3                          | 82.8                                          | 66.4 | 16.4  |
| 18    | .957                                            | .016                                      | .909    | .107    | 72.5                          | 79.0                                          | 67.6 | 11.4  |
| 19    | .925                                            | 29.999                                    | .860    | .139    | 73.7                          | 82.2                                          | 68.6 | 13.6  |
| 20    | <i>Sunday.</i>                                  |                                           |         |         |                               |                                               |      |       |
| 21    | .940                                            | 30.017                                    | .891    | .126    | 72.1                          | 81.6                                          | 64.8 | 16.8  |
| 22    | .975                                            | .045                                      | .923    | .122    | 71.3                          | 80.6                                          | 63.0 | 17.6  |
| 23    | .984                                            | .076                                      | .922    | .154    | 71.5                          | 81.0                                          | 64.5 | 16.5  |
| 24    | .947                                            | .042                                      | .892    | .150    | 72.7                          | 81.6                                          | 66.8 | 14.8  |
| 25    | .939                                            | .019                                      | .887    | .132    | 71.8                          | 80.6                                          | 64.8 | 15.8  |
| 26    | .966                                            | .033                                      | .919    | .114    | 71.6                          | 81.1                                          | 64.8 | 16.3  |
| 27    | <i>Sunday.</i>                                  |                                           |         |         |                               |                                               |      |       |
| 28    | .972                                            | .051                                      | .908    | .143    | 71.6                          | 78.9                                          | 65.6 | 13.3  |
| 29    | .931                                            | .007                                      | .869    | .138    | 70.7                          | 79.8                                          | 63.7 | 16.1  |
| 30    | .908                                            | 29.979                                    | .866    | .113    | 69.9                          | 80.0                                          | 62.3 | 17.7  |

The Mean height of the Barometer, as likewise the Mean Dry and Wet Bulb Thermometers are derived from the twenty-four hourly observations made during the day.

*Abstract of the Results of the Hourly Meteorological Observations  
taken at the Surveyor General's Office, Calcutta,  
in the month of November, 1859.*

Daily Means, &c. of the Observations and of the Hygrometrical elements  
dependent thereon.—(Continued.)

| Date. | Mean Wet Bulb Ther-<br>mometer. | Dry Bulb above Wet. | Computed Dew Point. | Dry Bulb above Dew<br>Point. | Mean Elastic force of<br>Vapour. | Mean Weight of Vapour<br>in a cubic foot of air. | Additional Weight of Va-<br>pour required for com-<br>plete saturation. | Mean degree of Humi-<br>dity, complete satura-<br>tion being unity. |
|-------|---------------------------------|---------------------|---------------------|------------------------------|----------------------------------|--------------------------------------------------|-------------------------------------------------------------------------|---------------------------------------------------------------------|
|       | °                               | °                   | °                   | °                            | Inches.                          | T. gr.                                           | T. gr.                                                                  |                                                                     |
| 1     | 71.6                            | 6.0                 | 68.6                | 9.0                          | 0.695                            | 7.53                                             | 2.54                                                                    | 0.75                                                                |
| 2     | 71.2                            | 6.3                 | 68.0                | 9.5                          | .681                             | .38                                              | .66                                                                     | .74                                                                 |
| 3     | 70.4                            | 5.9                 | 67.4                | 8.9                          | .668                             | .26                                              | .43                                                                     | .75                                                                 |
| 4     | 72.4                            | 5.3                 | 69.7                | 8.0                          | .720                             | .80                                              | .30                                                                     | .77                                                                 |
| 5     | 73.3                            | 5.5                 | 70.5                | 8.3                          | .739                             | 8.00                                             | .44                                                                     | .77                                                                 |
| 6     | Sunday.                         |                     |                     |                              |                                  |                                                  |                                                                         |                                                                     |
| 7     | 70.4                            | 5.7                 | 67.5                | 8.6                          | .670                             | 7.29                                             | .34                                                                     | .76                                                                 |
| 8     | 70.9                            | 5.6                 | 68.1                | 8.4                          | .684                             | .43                                              | .32                                                                     | .76                                                                 |
| 9     | 71.0                            | 5.0                 | 68.5                | 7.5                          | .692                             | .53                                              | .07                                                                     | .78                                                                 |
| 10    | 71.2                            | 5.3                 | 68.5                | 8.0                          | .692                             | .53                                              | .22                                                                     | .77                                                                 |
| 11    | 70.9                            | 5.8                 | 68.0                | 8.7                          | .681                             | .39                                              | .41                                                                     | .75                                                                 |
| 12    | 69.4                            | 7.1                 | 65.8                | 10.7                         | .634                             | 6.89                                             | .86                                                                     | .71                                                                 |
| 13    | Sunday.                         |                     |                     |                              |                                  |                                                  |                                                                         |                                                                     |
| 14    | 68.2                            | 6.5                 | 64.9                | 9.8                          | .615                             | .71                                              | .52                                                                     | .73                                                                 |
| 15    | 67.0                            | 7.0                 | 63.5                | 10.5                         | .588                             | .41                                              | .63                                                                     | .71                                                                 |
| 16    | 68.0                            | 6.3                 | 64.8                | 9.5                          | .613                             | .69                                              | .43                                                                     | .73                                                                 |
| 17    | 67.5                            | 6.8                 | 64.1                | 10.2                         | .599                             | .54                                              | .58                                                                     | .72                                                                 |
| 18    | 67.6                            | 4.9                 | 65.1                | 7.4                          | .619                             | .79                                              | 1.84                                                                    | .79                                                                 |
| 19    | 67.8                            | 5.9                 | 64.8                | 8.9                          | .613                             | .71                                              | 2.25                                                                    | .75                                                                 |
| 20    | Sunday.                         |                     |                     |                              |                                  |                                                  |                                                                         |                                                                     |
| 21    | 65.5                            | 6.6                 | 62.2                | 9.9                          | .563                             | .16                                              | .37                                                                     | .72                                                                 |
| 22    | 64.9                            | 6.4                 | 61.7                | 9.6                          | .554                             | .07                                              | .26                                                                     | .73                                                                 |
| 23    | 66.4                            | 5.1                 | 63.8                | 7.7                          | .593                             | .50                                              | 1.88                                                                    | .78                                                                 |
| 24    | 67.4                            | 5.3                 | 64.7                | 8.0                          | .611                             | .69                                              | .99                                                                     | .77                                                                 |
| 25    | 65.9                            | 5.9                 | 62.9                | 8.9                          | .576                             | .31                                              | 2.14                                                                    | .75                                                                 |
| 26    | 64.8                            | 6.8                 | 61.4                | 10.2                         | .548                             | .02                                              | .38                                                                     | .72                                                                 |
| 27    | Sunday.                         |                     |                     |                              |                                  |                                                  |                                                                         |                                                                     |
| 28    | 66.1                            | 5.5                 | 63.3                | 8.3                          | .584                             | .41                                              | 1.99                                                                    | .76                                                                 |
| 29    | 65.4                            | 5.3                 | 62.7                | 8.0                          | .572                             | .29                                              | .89                                                                     | .77                                                                 |
| 30    | 63.6                            | 6.3                 | 60.4                | 9.5                          | .530                             | 5.83                                             | 2.15                                                                    | .73                                                                 |

All the Hygrometrical elements are computed by the Greenwich Constants.

*Abstract of the Results of the Hourly Meteorological Observations  
taken at the Surveyor General's Office, Calcutta,  
in the month of November, 1859.*

Hourly Means, &c. of the Observations and of the Hygrometrical elements  
dependent thereon.

| Hour.          | Mean Height of<br>the Barometer<br>at 32° Fahr. | Range of the Barometer<br>for each hour during<br>the month. |         |         | Mean Dry Bulb<br>Thermometer. | Range of the Temperature<br>for each hour during<br>the month. |      |       |
|----------------|-------------------------------------------------|--------------------------------------------------------------|---------|---------|-------------------------------|----------------------------------------------------------------|------|-------|
|                |                                                 | Max.                                                         | Min.    | Diff.   |                               | Max.                                                           | Min. | Diff. |
|                | Inches.                                         | Inches.                                                      | Inches. | Inches. | °                             | °                                                              | °    | °     |
| Mid-<br>night. | 29.957                                          | 30.032                                                       | 29.857  | 0.175   | 70.6                          | 74.8                                                           | 65.7 | 9.1   |
| 1              | .946                                            | .018                                                         | .840    | .178    | 70.2                          | 74.8                                                           | 65.5 | 9.3   |
| 2              | .940                                            | .005                                                         | .834    | .171    | 69.8                          | 74.0                                                           | 65.0 | 9.0   |
| 3              | .931                                            | 29.978                                                       | .825    | .153    | 68.8                          | 73.6                                                           | 64.0 | 9.6   |
| 4              | .929                                            | .990                                                         | .807    | .183    | 68.8                          | 73.2                                                           | 63.6 | 9.6   |
| 5              | .947                                            | 30.009                                                       | .837    | .172    | 68.2                          | 72.6                                                           | 63.0 | 9.6   |
| 6              | .964                                            | .018                                                         | .860    | .158    | 67.7                          | 72.4                                                           | 62.5 | 9.9   |
| 7              | .985                                            | .038                                                         | .888    | .150    | 67.9                          | 72.8                                                           | 62.3 | 10.5  |
| 8              | 30.013                                          | .062                                                         | .918    | .144    | 72.0                          | 76.6                                                           | 67.0 | 9.6   |
| 9              | .027                                            | .075                                                         | .936    | .139    | 74.4                          | 79.8                                                           | 70.2 | 9.6   |
| 10             | .024                                            | .076                                                         | .933    | .143    | 76.5                          | 81.6                                                           | 72.6 | 9.0   |
| 11             | .001                                            | .052                                                         | .911    | .141    | 78.8                          | 83.6                                                           | 74.8 | 8.8   |
| Noon.          | 29.972                                          | .018                                                         | .882    | .136    | 80.8                          | 85.8                                                           | 75.6 | 10.2  |
| 1              | .942                                            | 29.989                                                       | .847    | .142    | 82.1                          | 86.8                                                           | 77.8 | 9.0   |
| 2              | .917                                            | .966                                                         | .826    | .140    | 82.8                          | 86.8                                                           | 78.2 | 8.6   |
| 3              | .904                                            | .947                                                         | .820    | .127    | 82.4                          | 86.6                                                           | 77.4 | 9.2   |
| 4              | .904                                            | .956                                                         | .810    | .146    | 80.5                          | 84.8                                                           | 76.6 | 8.2   |
| 5              | .911                                            | .975                                                         | .817    | .158    | 78.8                          | 83.4                                                           | 74.0 | 9.4   |
| 6              | .924                                            | .968                                                         | .825    | .143    | 76.6                          | 81.0                                                           | 71.4 | 9.6   |
| 7              | .939                                            | .986                                                         | .835    | .151    | 75.1                          | 78.8                                                           | 70.0 | 8.8   |
| 8              | .955                                            | 30.003                                                       | .839    | .164    | 73.8                          | 78.6                                                           | 68.8 | 9.8   |
| 9              | .968                                            | .016                                                         | .850    | .166    | 72.9                          | 77.0                                                           | 67.8 | 9.2   |
| 10             | .968                                            | .032                                                         | .858    | .174    | 72.1                          | 76.4                                                           | 66.8 | 9.6   |
| 11             | .957                                            | .026                                                         | .857    | .169    | 71.4                          | 76.4                                                           | 66.2 | 10.2  |

The Mean Height of the Barometer, as likewise the Mean Dry and Wet Bulb Thermometers are derived from the observations made at the several hours during the month.

*Abstract of the Results of the Hourly Meteorological Observations  
taken at the Surveyor General's Office, Calcutta,  
in the month of November, 1859.*

Hourly Means, &c. of the Observations and of the Hygrometrical elements  
dependent thereon.—(Continued.)

| Hour.          | Mean Wet Bulb<br>Thermometer. | Dry Bulb above Wet. | Computed Dew point. | Dry Bulb above Dew<br>point. | Mean elastic force of<br>Vapour. | Mean Weight of Va-<br>pour in a Cubic foot<br>of Air. | Additional weight of<br>vapour required for<br>complete saturation. | Mean degree of hu-<br>midity, complete satu-<br>ration being unity. |
|----------------|-------------------------------|---------------------|---------------------|------------------------------|----------------------------------|-------------------------------------------------------|---------------------------------------------------------------------|---------------------------------------------------------------------|
|                | o                             | o                   | o                   | o                            | Inches.                          | Troy grs.                                             | Troy grs.                                                           |                                                                     |
| Mid-<br>night. | 67.1                          | 3.5                 | 65.3                | 5.3                          | .623                             | 6.86                                                  | 1.29                                                                | 0.84                                                                |
| 1              | 67.0                          | 3.2                 | 65.4                | 4.8                          | .626                             | .88                                                   | .17                                                                 | .86                                                                 |
| 2              | 66.8                          | 3.0                 | 65.3                | 4.5                          | .623                             | .86                                                   | .09                                                                 | .86                                                                 |
| 3              | 65.8                          | 3.0                 | 64.3                | 4.5                          | .603                             | .65                                                   | .06                                                                 | .86                                                                 |
| 4              | 66.0                          | 2.8                 | 64.6                | 4.2                          | .609                             | .73                                                   | 0.98                                                                | .87                                                                 |
| 5              | 65.5                          | 2.7                 | 63.9                | 4.3                          | .595                             | .58                                                   | 1.00                                                                | .87                                                                 |
| 6              | 65.1                          | 2.6                 | 63.5                | 4.2                          | .588                             | .50                                                   | 0.96                                                                | .87                                                                 |
| 7              | 65.3                          | 2.6                 | 63.7                | 4.2                          | .591                             | .54                                                   | .97                                                                 | .87                                                                 |
| 8              | 67.6                          | 4.4                 | 65.4                | 6.6                          | .626                             | .85                                                   | 1.65                                                                | .81                                                                 |
| 9              | 68.9                          | 5.5                 | 66.1                | 8.3                          | .640                             | .99                                                   | 2.16                                                                | .76                                                                 |
| 10             | 69.4                          | 7.1                 | 65.8                | 10.7                         | .634                             | .89                                                   | .86                                                                 | .71                                                                 |
| 11             | 70.0                          | 8.8                 | 65.6                | 13.2                         | .630                             | .82                                                   | 3.62                                                                | .65                                                                 |
|                |                               |                     |                     |                              |                                  |                                                       |                                                                     |                                                                     |
| Noon.          | 70.8                          | 10.0                | 65.8                | 15.0                         | .634                             | .83                                                   | 4.24                                                                | .62                                                                 |
| 1              | 70.9                          | 11.2                | 65.3                | 16.8                         | .623                             | .69                                                   | .82                                                                 | .58                                                                 |
| 2              | 70.8                          | 12.0                | 64.8                | 18.0                         | .613                             | .58                                                   | 5.17                                                                | .56                                                                 |
| 3              | 70.7                          | 11.7                | 64.8                | 17.6                         | .613                             | .58                                                   | .03                                                                 | .57                                                                 |
| 4              | 69.9                          | 10.6                | 64.6                | 15.9                         | .609                             | .56                                                   | 4.42                                                                | .60                                                                 |
| 5              | 70.1                          | 8.7                 | 65.7                | 13.1                         | .632                             | .84                                                   | 3.60                                                                | .66                                                                 |
| 6              | 70.3                          | 6.3                 | 67.1                | 9.5                          | .661                             | 7.17                                                  | 2.60                                                                | .73                                                                 |
| 7              | 69.8                          | 5.3                 | 67.1                | 8.0                          | .661                             | .20                                                   | .14                                                                 | .77                                                                 |
| 8              | 69.2                          | 4.6                 | 66.9                | 6.9                          | .657                             | .18                                                   | 1.80                                                                | .80                                                                 |
| 9              | 68.7                          | 4.2                 | 66.6                | 6.3                          | .651                             | .12                                                   | .61                                                                 | .82                                                                 |
| 10             | 68.2                          | 3.9                 | 66.2                | 5.9                          | .642                             | .03                                                   | .50                                                                 | .82                                                                 |
| 11             | 67.6                          | 3.8                 | 65.7                | 5.7                          | .632                             | 6.94                                                  | .41                                                                 | .83                                                                 |

All the Hygrometrical elements are computed by the Greenwich Constants.



*Abstract of the Results of the Hourly Meteorological Observations  
taken at the Surveyor General's Office, Calcutta,  
in the month of November, 1859.*

Solar Radiation, Weather, &c.

| Date. | Max. Solar radiation. | Rain Gauge 5 feet above Ground. | Prevailing direction of the Wind. | General Aspect of the Sky.                                                |
|-------|-----------------------|---------------------------------|-----------------------------------|---------------------------------------------------------------------------|
|       | o                     | Inches.                         |                                   |                                                                           |
| 1     | 137.0                 | ..                              | S. W. & N. W.                     | Cloudless.                                                                |
| 2     | 143.0                 | ..                              | N. W. & W. & N.                   | Cloudless.                                                                |
| 3     | 142.0                 | ..                              | S. W. & N. W.                     | Cloudless.                                                                |
| 4     | 147.5                 | ..                              | S. W. & S.                        | Cloudless.                                                                |
| 5     | 141.8                 | ..                              | N. & S.                           | Cloudless till 8 A. M. Scatd. \i & \i till 5 P. M. cloudless afterwards.  |
| 6     | <i>Sunday.</i>        |                                 |                                   |                                                                           |
| 7     | 141.2                 | ..                              | N. E. & N. W.                     | Cloudless.                                                                |
| 8     | 140.9                 | ..                              | N. & S.                           | Cloudless till 10 A. M. Scatd. \i & \i till 3 P. M. cloudless afterwards. |
| 9     | 132.0                 | ..                              | N. W.                             | Cloudless till 7 A. M. Scatd. \i & \i afterwards.                         |
| 10    | 140.0                 | ..                              | S. W. & N. W. & N.                | Scatd. \i & \i till 5 P. M. cloudless afterwards.                         |
| 11    | 130.0                 | ..                              | S. W. & N.                        | Scatd. \i till 4 A. M. cloudy till 4 P. M. Scatd. \i afterwards.          |
| 12    | 142.0                 | ..                              | N. W. & E. & S. W.                | Cloudless till 3 A. M. Scatd. \i & \i till 7 P. M. cloudless afterwards.  |
| 13    | <i>Sunday.</i>        |                                 |                                   |                                                                           |
| 14    | 144.0                 | ..                              | N. & N. W.                        | Cloudless.                                                                |
| 15    | 141.0                 | ..                              | N. & N. W.                        | Cloudless till 6 A. M. Scatd. \i till 3 P. M. cloudless afterwards.       |
| 16    | 146.0                 | ..                              | E. & N. & S. W.                   | Scatd. \i & \i till 5 P. M. cloudless afterwards.                         |
| 17    | 143.2                 | ..                              | N. & E.                           | Cloudless.                                                                |
| 18    | ..                    | ..                              | N.                                | Scatd. clouds.                                                            |
| 19    | 138.0                 | ..                              | N.                                | Cloudy till 11 A. M. cloudless afterwards.                                |
| 20    | <i>Sunday.</i>        |                                 |                                   |                                                                           |
| 21    | 138.8                 | ..                              | N.                                | Cloudless.                                                                |
| 22    | 138.0                 | ..                              | N. & W.                           | Cloudless.                                                                |
| 23    | 136.5                 | ..                              | N. W. & E.                        | Cloudless till 3 A. M. Scatd. \i till 8 P. M. cloudless afterwards.       |
| 24    | 139.0                 | ..                              | N. & N. W.                        | Scatd. \i till 1 P. M. cloudless afterwards.                              |
| 25    | 137.0                 | ..                              | N.                                | Cloudless.                                                                |
| 26    | 139.0                 | ..                              | N. & N. W.                        | Cloudless till 4 A. M. Scatd. \i till 11 A. M. cloudless afterwards.      |
| 27    | <i>Sunday.</i>        |                                 |                                   |                                                                           |
| 28    | 137.0                 | ..                              | N.                                | Cloudless till 6 A. M. Scatd. \i till 7 P. M. cloudless afterwards.       |
| 29    | 135.7                 | ..                              | N.                                | Cloudless till 5 A. M. Scatd. \i till 11 A. M. cloudless afterwards.      |
| 30    | 137.5                 | ..                              | N.                                | Cloudless.                                                                |

\i Cirri, \i cirro strati, \i cumuli, \i cumulo strati, \i nimbi, —i strati  
\i cirro cumuli.

*Abstract of the Results of the Hourly Meteorological Observations  
taken at the Surveyor General's Office, Calcutta,  
in the month of November, 1859.*

## MONTHLY RESULTS.

|                                                                 |    |    | Inches |
|-----------------------------------------------------------------|----|----|--------|
| Mean height of the Barometer for the month,                     | .. | .. | 29.955 |
| Max. height of the Barometer, occurred at 10 A. M. on the 23rd, | .. | .. | 30.076 |
| Min. height of the Barometer, occurred at 4 A. M. on the 4th,   | .. | .. | 29.807 |
| <i>Extreme Range</i> of the Barometer during the month,         | .. | .. | 0.269  |
| Mean of the Daily Max. Pressures,                               | .. | .. | 30.028 |
| Ditto ditto Min. ditto,                                         | .. | .. | 29.899 |
| <i>Mean daily range</i> of the Barometer during the month,      | .. | .. | 0.129  |

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|                                                              |    |    | °    |
|--------------------------------------------------------------|----|----|------|
| Mean Dry Bulb Thermometer for the month,                     | .. | .. | 74.3 |
| Max. Temperature occurred at 1 & 2 P. M. on the 5th,         | .. | .. | 86.8 |
| Min. Temperature occurred at 7 A. M. on the 30th,            | .. | .. | 62.3 |
| <i>Extreme range</i> of the Temperature during the month,    | .. | .. | 24.5 |
| Mean of the daily Max. Temperatures,                         | .. | .. | 82.9 |
| Ditto ditto Min. ditto,                                      | .. | .. | 67.6 |
| <i>Mean daily range</i> of the Temperature during the month, | .. | .. | 15.3 |

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|                                                            |    |    | °      |
|------------------------------------------------------------|----|----|--------|
| Mean Wet Bulb Thermometer for the month,                   | .. | .. | 68.4   |
| Mean Dry Bulb Thermometer above Mean Wet Bulb Thermometer, | .. | .. | 5.9    |
| Computed Mean Dew Point for the month,                     | .. | .. | 65.4   |
| Mean Dry Bulb Thermometer above computed Mean Dew Point,   | .. | .. | 8.9    |
|                                                            |    |    | Inches |
| Mean Elastic force of vapour for the month,                | .. | .. | 0.626  |

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|                                                                         |    |    | Troy grains. |
|-------------------------------------------------------------------------|----|----|--------------|
| Mean weight of vapour for the month,                                    | .. | .. | 6.82         |
| Additional weight of vapour required for complete saturation,           | .. | .. | 2.30         |
| Mean degree of humidity for the month, complete saturation being unity, | .. | .. | 0.75         |

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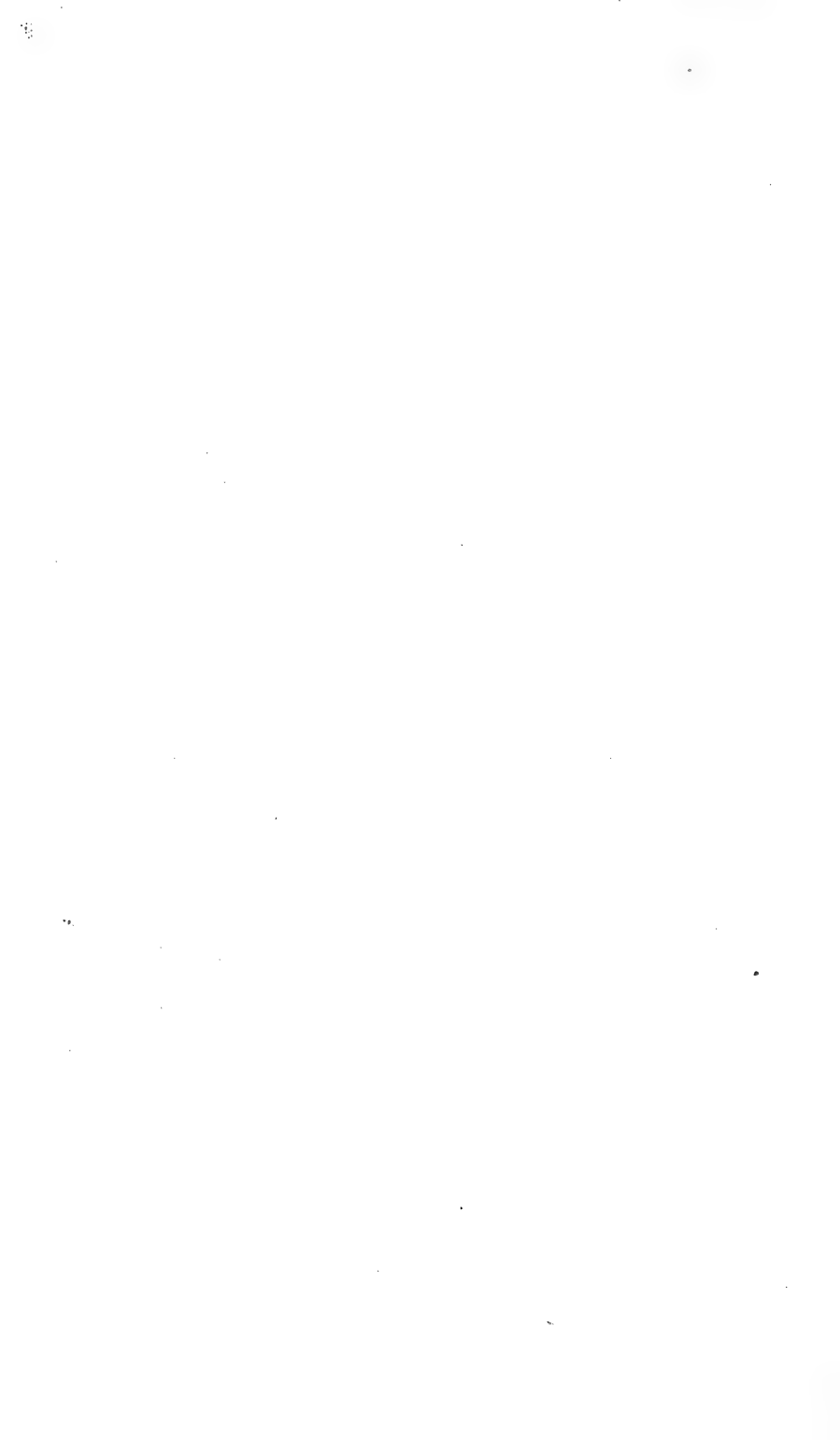
|                                                    |    |                       | Inches |
|----------------------------------------------------|----|-----------------------|--------|
| Rained no days.—Max. fall of rain during 24 hours, | .. | ..                    | Nil.   |
| Total amount of rain during the month,             | .. | ..                    | Nil.   |
| Prevailing direction of the Wind,                  | .. | .. N. & N. W. & S. W. |        |

*Abstract of the Results of the Hourly Meteorological Observations  
taken at the Surveyor General's Office, Calcutta,  
in the month of November, 1859.*

MONTHLY RESULTS.

Table showing the number of days on which at a given hour any particular wind  
blew, together with the number of days on which at the same hour,  
when any particular wind was blowing, it rained.

| Hour.     | N.           | Rain on.<br>N. E. | Rain on.<br>E. | Rain on.<br>S. E. | Rain on.<br>S. | Rain on.<br>S. W. | Rain on.<br>W. | Rain on.<br>N. W. | Rain on.<br>Calm. | Rain on. | Missed. |
|-----------|--------------|-------------------|----------------|-------------------|----------------|-------------------|----------------|-------------------|-------------------|----------|---------|
|           | No. of days. |                   |                |                   |                |                   |                |                   |                   |          |         |
| Midnight. | 14           | 1                 |                |                   |                | 3                 | 2              | 5                 |                   | 1        |         |
| 1         | 14           | 2                 |                |                   | 1              | 4                 | 1              | 4                 |                   |          |         |
| 2         | 13           | 2                 |                |                   | 1              | 4                 | 1              | 4                 |                   | 1        |         |
| 3         | 13           | 1                 | 1              |                   | 1              | 3                 |                | 4                 |                   | 3        |         |
| 4         | 13           | 1                 | 1              |                   | 1              | 4                 | 1              | 4                 |                   | 1        |         |
| 5         | 13           | 1                 | 1              |                   | 1              | 4                 | 1              | 4                 |                   | 1        |         |
| 6         | 14           | 2                 | 2              |                   | 1              | 3                 | 1              | 3                 |                   |          |         |
| 7         | 10           | 4                 | 3              |                   | 1              | 3                 | 2              | 3                 |                   |          |         |
| 8         | 12           | 3                 | 2              |                   | 2              | 1                 |                | 5                 |                   | 1        |         |
| 9         | 13           | 5                 | 2              |                   | 2              | 1                 |                | 3                 |                   |          |         |
| 10        | 14           | 4                 | 3              |                   |                | 1                 | 2              | 2                 |                   |          |         |
| 11        | 10           | 5                 | 2              |                   | 1              | 2                 | 4              | 2                 |                   |          |         |
| Noon.     | 13           | 1                 | 3              |                   |                | 3                 | 4              | 2                 |                   |          |         |
| 1         | 9            | 3                 | 2              |                   | 2              | 3                 |                | 7                 |                   |          |         |
| 2         | 9            | 3                 | 1              |                   | 1              | 3                 | 2              | 7                 |                   |          |         |
| 3         | 7            | 3                 | 1              |                   | 1              | 4                 |                | 9                 |                   | 1        |         |
| 4         | 5            | 2                 | 1              |                   | 2              | 3                 | 1              | 12                |                   |          |         |
| 5         | 10           | 1                 | 1              | 1                 | 2              | 2                 |                | 9                 |                   |          |         |
| 6         | 11           |                   | 2              | 1                 | 1              | 5                 |                | 6                 |                   |          |         |
| 7         | 10           |                   | 2              |                   | 1              | 5                 | 1              | 6                 |                   | 1        |         |
| 8         | 11           |                   | 2              |                   | 1              | 5                 | 1              | 6                 |                   |          |         |
| 9         | 11           |                   | 2              |                   | 1              | 5                 | 1              | 6                 |                   |          |         |
| 10        | 11           |                   | 2              |                   | 1              | 6                 | 1              | 5                 |                   |          |         |
| 11        | 11           |                   | 2              |                   |                | 6                 | 1              | 5                 |                   | 1        |         |



*Abstract of the Results of the Hourly Meteorological Observations  
taken at the Surveyor General's Office, Calcutta,  
in the month of December, 1859.*

Latitude 22° 33' 1" North. Longitude 88° 20' 34" East.

Feet.

Height of the Cistern of the Standard Barometer above the Sea level, 18.11

Daily Means, &c. of the Observations and of the Hygrometrical elements  
dependent thereon.

| Date. | Mean Height of<br>the Barometer<br>at 32° Fahr. | Range of the Barometer<br>during the day. |         |         | Mean Dry Bulb<br>Thermometer. | Range of the Tempera-<br>ture during the day. |      |       |
|-------|-------------------------------------------------|-------------------------------------------|---------|---------|-------------------------------|-----------------------------------------------|------|-------|
|       |                                                 | Max.                                      | Min.    | Diff.   |                               | Max.                                          | Min. | Diff. |
|       | Inches.                                         | Inches.                                   | Inches. | Inches. | °                             | °                                             | °    | °     |
| 1     | 29.894                                          | 29.973                                    | 29.821  | 0.152   | 71.5                          | 80.0                                          | 64.0 | 16.0  |
| 2     | .897                                            | .961                                      | .836    | .125    | 72.8                          | 80.6                                          | 66.6 | 14.0  |
| 3     | .928                                            | .992                                      | .880    | .112    | 71.9                          | 79.3                                          | 66.6 | 12.7  |
| 4     | Sunday.                                         |                                           |         |         |                               |                                               |      |       |
| 5     | .942                                            | 30.018                                    | .886    | .132    | 72.7                          | 79.4                                          | 67.5 | 11.9  |
| 6     | .940                                            | .013                                      | .887    | .126    | 74.2                          | 79.2                                          | 70.8 | 8.4   |
| 7     | .963                                            | .029                                      | .916    | .113    | 75.0                          | 81.9                                          | 69.9 | 12.0  |
| 8     | .969                                            | .047                                      | .924    | .123    | 74.9                          | 81.2                                          | 69.0 | 12.2  |
| 9     | .983                                            | .051                                      | .931    | .120    | 73.5                          | 77.4                                          | 70.6 | 6.8   |
| 10    | 30.019                                          | .092                                      | .975    | .117    | 73.0                          | 79.9                                          | 67.8 | 12.1  |
| 11    | Sunday.                                         |                                           |         |         |                               |                                               |      |       |
| 12    | .061                                            | .138                                      | 30.002  | .136    | 67.0                          | 77.0                                          | 59.0 | 18.0  |
| 13    | .040                                            | .124                                      | 29.981  | .143    | 66.7                          | 76.4                                          | 59.2 | 17.2  |
| 14    | .059                                            | .134                                      | 30.011  | .123    | 65.6                          | 75.2                                          | 58.0 | 17.2  |
| 15    | .092                                            | .163                                      | .050    | .113    | 65.1                          | 76.2                                          | 56.2 | 20.0  |
| 16    | .106                                            | .166                                      | .065    | .101    | 66.0                          | 77.6                                          | 56.4 | 21.2  |
| 17    | .111                                            | .181                                      | .058    | .123    | 67.2                          | 78.4                                          | 60.0 | 18.4  |
| 18    | Sunday.                                         |                                           |         |         |                               |                                               |      |       |
| 19    | .030                                            | .118                                      | 29.964  | .154    | 66.6                          | 77.0                                          | 58.6 | 18.4  |
| 20    | 29.986                                          | .080                                      | .930    | .150    | 68.8                          | 79.6                                          | 60.4 | 19.2  |
| 21    | 30.003                                          | .081                                      | .946    | .135    | 70.8                          | 80.6                                          | 64.1 | 16.5  |
| 22    | .071                                            | .156                                      | 30.023  | .133    | 66.0                          | 75.6                                          | 58.6 | 17.0  |
| 23    | .090                                            | .170                                      | .040    | .130    | 65.2                          | 75.5                                          | 56.5 | 19.0  |
| 24    | .105                                            | .195                                      | .038    | .157    | 66.8                          | 76.2                                          | 59.0 | 17.2  |
| 25    | Sunday.                                         |                                           |         |         |                               |                                               |      |       |
| 26    | .045                                            | .123                                      | 29.973  | .150    | 67.2                          | 75.4                                          | 60.5 | 14.9  |
| 27    | .021                                            | .099                                      | .971    | .128    | 66.5                          | 76.8                                          | 58.6 | 18.2  |
| 28    | .005                                            | .081                                      | .955    | .126    | 66.0                          | 77.0                                          | 57.6 | 19.4  |
| 29    | 29.977                                          | .053                                      | .915    | .138    | 65.3                          | 77.0                                          | 56.2 | 20.8  |
| 30    | .980                                            | .053                                      | .933    | .120    | 64.2                          | 75.6                                          | 56.8 | 18.8  |
| 31    | .969                                            | .050                                      | .916    | .134    | 63.6                          | 75.0                                          | 54.0 | 21.0  |

The Mean height of the Barometer, as likewise the Mean Dry and Wet Bulb Thermometers are derived from the twenty-four hourly observations made during the day.

*Meteorological Observations.*

*Abstract of the Results of the Hourly Meteorological Observations  
taken at the Surveyor General's Office, Calcutta,  
in the month of December, 1859.*

Daily Means, &c. of the Observations and of the Hygrometrical elements  
dependent thereon.—(Continued.)

| Date. | Mean Wet Bulb Ther-<br>mometer. | Dry Bulb above Wet. | Computed Dew Point. | Dry Bulb above Dew<br>Point. | Mean Elastic force of<br>Vapour. | Mean Weight of Vapour<br>in a cubic foot of air. | Additional Weight of Va-<br>pour required for com-<br>plete saturation. | Mean degree of Humi-<br>dity, complete satura-<br>tion being unity. |
|-------|---------------------------------|---------------------|---------------------|------------------------------|----------------------------------|--------------------------------------------------|-------------------------------------------------------------------------|---------------------------------------------------------------------|
| 1     | 65.0                            | 6.5                 | 61.7                | 9.8                          | 0.554                            | 6.07                                             | 2.31                                                                    | 0.72                                                                |
| 2     | 67.2                            | 5.6                 | 64.4                | 8.4                          | .605                             | .63                                              | .08                                                                     | .76                                                                 |
| 3     | 66.5                            | 5.4                 | 63.8                | 8.1                          | .593                             | .50                                              | 1.98                                                                    | .77                                                                 |
| 4     | Sunday.                         |                     |                     |                              |                                  |                                                  |                                                                         |                                                                     |
| 5     | 67.6                            | 5.1                 | 65.0                | 7.7                          | .617                             | .76                                              | .92                                                                     | .78                                                                 |
| 6     | 69.2                            | 5.0                 | 66.7                | 7.5                          | .653                             | 7.11                                             | .98                                                                     | .78                                                                 |
| 7     | 70.0                            | 5.0                 | 67.5                | 7.5                          | .670                             | .30                                              | 2.01                                                                    | .78                                                                 |
| 8     | 69.8                            | 5.1                 | 67.2                | 7.7                          | .664                             | .23                                              | .05                                                                     | .78                                                                 |
| 9     | 68.8                            | 4.7                 | 66.4                | 7.1                          | .646                             | .07                                              | 1.83                                                                    | .79                                                                 |
| 10    | 66.2                            | 6.8                 | 62.8                | 10.2                         | .574                             | 6.28                                             | 2.48                                                                    | .72                                                                 |
| 11    | Sunday.                         |                     |                     |                              |                                  |                                                  |                                                                         |                                                                     |
| 12    | 60.7                            | 6.3                 | 56.9                | 10.1                         | .472                             | 5.21                                             | .09                                                                     | .71                                                                 |
| 13    | 61.4                            | 5.3                 | 58.2                | 8.5                          | .493                             | .45                                              | 1.78                                                                    | .75                                                                 |
| 14    | 60.0                            | 5.6                 | 56.6                | 9.0                          | .467                             | .18                                              | .82                                                                     | .74                                                                 |
| 15    | 59.2                            | 5.9                 | 55.7                | 9.4                          | .453                             | .04                                              | .85                                                                     | .73                                                                 |
| 16    | 60.6                            | 5.4                 | 57.4                | 8.6                          | .480                             | .31                                              | .77                                                                     | .75                                                                 |
| 17    | 62.3                            | 4.9                 | 59.4                | 7.8                          | .513                             | .67                                              | .68                                                                     | .77                                                                 |
| 18    | Sunday.                         |                     |                     |                              |                                  |                                                  |                                                                         |                                                                     |
| 19    | 61.5                            | 5.1                 | 58.4                | 8.2                          | .496                             | .49                                              | .72                                                                     | .76                                                                 |
| 20    | 64.6                            | 4.2                 | 62.5                | 6.3                          | .568                             | 6.27                                             | .44                                                                     | .81                                                                 |
| 21    | 66.0                            | 4.8                 | 63.6                | 7.2                          | .590                             | .48                                              | .72                                                                     | .79                                                                 |
| 22    | 59.2                            | 6.8                 | 55.1                | 10.9                         | .444                             | 4.93                                             | 2.15                                                                    | .70                                                                 |
| 23    | 59.5                            | 5.7                 | 56.1                | 9.1                          | .459                             | 5.11                                             | 1.80                                                                    | .74                                                                 |
| 24    | 61.5                            | 5.3                 | 58.3                | 8.5                          | .494                             | .46                                              | .80                                                                     | .75                                                                 |
| 25    | Sunday.                         |                     |                     |                              |                                  |                                                  |                                                                         |                                                                     |
| 26    | 63.0                            | 4.2                 | 60.5                | 6.7                          | .532                             | .89                                              | .46                                                                     | .80                                                                 |
| 27    | 61.9                            | 4.6                 | 59.1                | 7.4                          | .508                             | .63                                              | .56                                                                     | .78                                                                 |
| 28    | 61.0                            | 5.0                 | 58.0                | 8.0                          | .489                             | .42                                              | .66                                                                     | .77                                                                 |
| 29    | 59.7                            | 5.6                 | 56.3                | 9.0                          | .462                             | .14                                              | .79                                                                     | .74                                                                 |
| 30    | 58.9                            | 5.3                 | 55.2                | 9.0                          | .445                             | 4.96                                             | .73                                                                     | .74                                                                 |
| 31    | 58.3                            | 5.3                 | 54.6                | 9.0                          | .437                             | .87                                              | .70                                                                     | .74                                                                 |

All the Hygrometrical elements are computed by the Greenwich Constants.

*Abstract of the Results of the Hourly Meteorological Observations  
taken at the Surveyor General's Office, Calcutta,  
in the month of December, 1859.*

Hourly Means, &c. of the Observations and of the Hygrometrical elements  
dependent thereon.

| Hour.          | Mean Height of<br>the Barometer<br>at 32° Fahr. | Range of the Barometer<br>for each hour during<br>the month. |         |         | Mean Dry Bulb<br>Thermometer. | Range of the Temperature<br>for each hour during<br>the month. |      |       |
|----------------|-------------------------------------------------|--------------------------------------------------------------|---------|---------|-------------------------------|----------------------------------------------------------------|------|-------|
|                |                                                 | Max.                                                         | Min.    | Diff.   |                               | Max.                                                           | Min. | Diff. |
|                | Inches.                                         | Inches.                                                      | Inches. | Inches. | o                             | o                                                              | o    | o     |
| Mid-<br>night. | 30.002                                          | 30.120                                                       | 29.880  | 0.240   | 65.3                          | 73.4                                                           | 58.4 | 15.0  |
| 1              | 29.998                                          | .108                                                         | .870    | .238    | 64.5                          | 73.0                                                           | 57.4 | 15.6  |
| 2              | .988                                            | .087                                                         | .841    | .246    | 64.0                          | 72.8                                                           | 57.0 | 15.8  |
| 3              | .981                                            | .078                                                         | .836    | .242    | 63.3                          | 72.6                                                           | 56.6 | 16.0  |
| 4              | .982                                            | .080                                                         | .842    | .238    | 62.6                          | 72.6                                                           | 56.0 | 16.6  |
| 5              | .994                                            | .103                                                         | .864    | .239    | 62.4                          | 72.2                                                           | 55.2 | 17.0  |
| 6              | 30.012                                          | .122                                                         | .878    | .244    | 61.9                          | 71.8                                                           | 54.0 | 17.8  |
| 7              | .033                                            | .132                                                         | .892    | .240    | 61.7                          | 70.8                                                           | 54.0 | 16.8  |
| 8              | .065                                            | .173                                                         | .914    | .259    | 64.3                          | 71.6                                                           | 58.3 | 13.3  |
| 9              | .082                                            | .195                                                         | .930    | .265    | 67.1                          | 72.4                                                           | 61.8 | 10.6  |
| 10             | .083                                            | .184                                                         | .936    | .248    | 70.1                          | 76.0                                                           | 66.6 | 9.4   |
| 11             | .066                                            | .174                                                         | .925    | .249    | 72.9                          | 77.8                                                           | 69.8 | 8.0   |
| Noon.          | .037                                            | .140                                                         | .916    | .224    | 75.5                          | 79.8                                                           | 72.4 | 7.4   |
| 1              | .004                                            | .108                                                         | .884    | .224    | 77.1                          | 81.9                                                           | 74.2 | 7.7   |
| 2              | 29.978                                          | .083                                                         | .843    | .240    | 77.7                          | 81.4                                                           | 75.0 | 6.4   |
| 3              | .964                                            | .075                                                         | .835    | .240    | 77.2                          | 81.3                                                           | 74.2 | 7.1   |
| 4              | .959                                            | .065                                                         | .824    | .241    | 75.5                          | 79.8                                                           | 72.4 | 7.4   |
| 5              | .965                                            | .070                                                         | .821    | .249    | 73.6                          | 78.8                                                           | 70.2 | 8.6   |
| 6              | .979                                            | .090                                                         | .854    | .236    | 71.6                          | 77.8                                                           | 67.6 | 10.2  |
| 7              | .994                                            | .104                                                         | .857    | .247    | 69.9                          | 76.2                                                           | 64.5 | 11.7  |
| 8              | 30.009                                          | .119                                                         | .863    | .256    | 68.8                          | 75.8                                                           | 63.3 | 12.5  |
| 9              | .022                                            | .126                                                         | .868    | .258    | 67.7                          | 75.0                                                           | 61.8 | 13.2  |
| 10             | .023                                            | .140                                                         | .876    | .264    | 66.9                          | 74.7                                                           | 60.6 | 14.1  |
| 11             | .016                                            | .129                                                         | .882    | .247    | 66.1                          | 74.4                                                           | 59.2 | 15.2  |

The Mean Height of the Barometer, as likewise the Mean Dry and Wet Bulb Thermometers are derived from the observations made at the several hours during the month.

*Abstract of the Results of the Hourly Meteorological Observations  
taken at the Surveyor General's Office, Calcutta,  
in the month of December, 1859.*

Hourly Means, &c. of the Observations and of the Hygrometrical elements  
dependent thereon.—(Continued.)

| Hour.          | Mean Wet Bulb<br>Thermometer. | Dry Bulb above Wet. | Computed Dew point. | Dry Bulb above Dew<br>point. | Mean elastic force of<br>Vapour. | Mean Weight of Va-<br>pour in a Cubic foot<br>of Air. | Additional weight of<br>vapour required for<br>complete saturation. | Mean degree of hu-<br>midity, complete satu-<br>ration being unity. |
|----------------|-------------------------------|---------------------|---------------------|------------------------------|----------------------------------|-------------------------------------------------------|---------------------------------------------------------------------|---------------------------------------------------------------------|
|                | o                             | o                   | o                   | o                            | Inches.                          | Troy grs.                                             | Troy grs.                                                           |                                                                     |
| Mid-<br>night. | 62.2                          | 3.1                 | 60.3                | 5.0                          | .528                             | 5.87                                                  | 1.06                                                                | .85                                                                 |
| 1              | 61.6                          | 2.9                 | 59.9                | 4.6                          | .521                             | .79                                                   | 0.97                                                                | .86                                                                 |
| 2              | 61.1                          | 2.9                 | 59.1                | 4.9                          | .508                             | .65                                                   | 1.00                                                                | .85                                                                 |
| 3              | 60.4                          | 2.9                 | 58.4                | 4.9                          | .496                             | .52                                                   | 0.99                                                                | .85                                                                 |
| 4              | 59.9                          | 2.7                 | 58.0                | 4.6                          | .489                             | .45                                                   | .92                                                                 | .86                                                                 |
| 5              | 59.6                          | 2.8                 | 57.6                | 4.8                          | .483                             | .39                                                   | .94                                                                 | .85                                                                 |
| 6              | 59.2                          | 2.7                 | 57.3                | 4.6                          | .478                             | .34                                                   | .89                                                                 | .86                                                                 |
| 7              | 59.0                          | 2.7                 | 57.1                | 4.6                          | .475                             | .31                                                   | .88                                                                 | .86                                                                 |
| 8              | 60.5                          | 3.8                 | 57.8                | 6.5                          | .486                             | .40                                                   | 1.32                                                                | .80                                                                 |
| 9              | 62.1                          | 5.0                 | 59.1                | 8.0                          | .508                             | .62                                                   | .70                                                                 | .77                                                                 |
| 10             | 63.5                          | 6.6                 | 60.2                | 9.9                          | .527                             | .79                                                   | 2.24                                                                | .72                                                                 |
| 11             | 65.0                          | 7.9                 | 61.0                | 11.9                         | .541                             | .91                                                   | .82                                                                 | .68                                                                 |
|                |                               |                     |                     |                              |                                  |                                                       |                                                                     |                                                                     |
| Noon.          | 66.3                          | 9.2                 | 61.7                | 13.8                         | .554                             | 6.02                                                  | 3.44                                                                | .64                                                                 |
| 1              | 67.0                          | 10.1                | 61.9                | 15.2                         | .557                             | .04                                                   | .88                                                                 | .61                                                                 |
| 2              | 67.5                          | 10.2                | 62.4                | 15.3                         | .567                             | .14                                                   | .96                                                                 | .61                                                                 |
| 3              | 67.2                          | 10.0                | 62.2                | 15.0                         | .563                             | .10                                                   | .85                                                                 | .61                                                                 |
| 4              | 66.3                          | 9.2                 | 61.7                | 13.8                         | .554                             | .02                                                   | .44                                                                 | .64                                                                 |
| 5              | 66.0                          | 7.6                 | 62.2                | 11.4                         | .563                             | .15                                                   | 2.78                                                                | .69                                                                 |
| 6              | 65.8                          | 5.8                 | 62.9                | 8.7                          | .576                             | .31                                                   | .09                                                                 | .75                                                                 |
| 7              | 65.0                          | 4.9                 | 62.5                | 7.4                          | .568                             | .26                                                   | 1.72                                                                | .78                                                                 |
| 8              | 64.4                          | 4.4                 | 62.2                | 6.6                          | .563                             | .20                                                   | .51                                                                 | .80                                                                 |
| 9              | 63.6                          | 4.1                 | 61.1                | 6.6                          | .543                             | 5.99                                                  | .47                                                                 | .80                                                                 |
| 10             | 63.1                          | 3.8                 | 60.8                | 6.1                          | .537                             | .95                                                   | .33                                                                 | .82                                                                 |
| 11             | 62.6                          | 3.5                 | 60.5                | 5.6                          | .532                             | .90                                                   | .20                                                                 | .83                                                                 |

All the Hygrometrical elements are computed by the Greenwich Constants.



*Abstract of the Results of the Hourly Meteorological Observations  
taken at the Surveyor General's Office, Calcutta,  
in the month of December, 1859.*

Solar Radiation, Weather, &c.

| Date. | Max. Solar radiation. | Rain Gauge 5 feet above Ground. | Prevailing direction of the Wind. | General Aspect of the Sky.                                                                        |
|-------|-----------------------|---------------------------------|-----------------------------------|---------------------------------------------------------------------------------------------------|
|       | °                     | Inches.                         |                                   |                                                                                                   |
| 1     | 136.0                 | ..                              | N.                                | Cloudy till 10 A. M. Scatd. \i till 4 P. M. cloudy afterwards.                                    |
| 2     | 134.0                 | ..                              | N.                                | Cloudless till 5 A. M. Scatd. clouds afterwards.                                                  |
| 3     | 133.4                 | ..                              | N. & N. W.                        | Cloudy till 6 A. M. Scatd. \i till Noon cloudless till 4 P. M. cloudy afterwards.                 |
| 4     | <i>Sunday.</i>        |                                 |                                   |                                                                                                   |
| 5     | 116.0                 | ..                              | N. & N. W.                        | Cloudy.                                                                                           |
| 6     | ..                    | ..                              | N. & N. W.                        | Cloudy.                                                                                           |
| 7     | 135.4                 | ..                              | N. W. & N. E.                     | Cloudy till 9 A. M. Scatd. \i and \i till 4 P. M. cloudless afterwards.                           |
| 8     | 138.0                 | ..                              | N.                                | Cloudy.                                                                                           |
| 9     | ..                    | ..                              | N. E. & N.                        | Cloudy.                                                                                           |
| 10    | 130.0                 | ..                              | N. W. & N. & N. E.                | Scatd. clouds till 4 P. M. cloudless afterwards.                                                  |
| 11    | <i>Sunday.</i>        |                                 |                                   |                                                                                                   |
| 12    | 135.5                 | ..                              | W. & N. W.                        | Cloudless.                                                                                        |
| 13    | 134.0                 | ..                              | W. & N. W.                        | Cloudless.                                                                                        |
| 14    | 134.8                 | ..                              | N. & W.                           | Cloudless.                                                                                        |
| 15    | 135.0                 | ..                              | N. & N. W.                        | Cloudless; also foggy morning and evening.                                                        |
| 16    | 131.0                 | ..                              | N. & N. W.                        | Cloudless.                                                                                        |
| 17    | 133.0                 | ..                              | N. & N. W.                        | Cloudless.                                                                                        |
| 18    | <i>Sunday.</i>        |                                 |                                   |                                                                                                   |
| 19    | 132.0                 | ..                              | N. & N. W.                        | Cloudless.                                                                                        |
| 20    | 138.2                 | ..                              | N. & N. E.                        | Cloudless till 10 A. M. Scatd. \i and \i till 6 P. M. cloudless afterwards.                       |
| 21    | 135.5                 | ..                              | N. W. & N.                        | Cloudless.                                                                                        |
| 22    | 133.7                 | ..                              | N.                                | Cloudless till 7 A. M. Scatd. \i till 5 P. M. cloudless afterwards.                               |
| 23    | 132.0                 | ..                              | N. W. & N.                        | Cloudless nearly the whole day.                                                                   |
| 24    | 135.0                 | ..                              | N. & N. W.                        | Cloudless till 11 A. M. \i about zenith till 3 P. M. Scatd. \i till 9 P. M. cloudless afterwards. |
| 25    | <i>Sunday.</i>        |                                 |                                   |                                                                                                   |
| 26    | 130.0                 | ..                              | N. & N. W.                        | Cloudless till 6 A. M. Scatd. \i till 4 P. M. cloudless afterwards.                               |
| 27    | 130.0                 | ..                              | N. & N. W.                        | Cloudless.                                                                                        |
| 28    | 132.9                 | ..                              | W. & N. W.                        | Cloudless.                                                                                        |
| 29    | 135.4                 | ..                              | N. & W.                           | Cloudless.                                                                                        |
| 30    | 133.0                 | ..                              | N. W. & W.                        | Cloudless.                                                                                        |
| 31    | 132.2                 | ..                              | N. W.                             | Cloudless.                                                                                        |

\i Cirri, \i cirro strati, \i cumuli, \i cumulo strati, \i nimbi, —i strati  
 \i cirro cumuli.

*Abstract of the Results of the Hourly Meteorological Observations  
taken at the Surveyor General's Office, Calcutta,  
in the month of December, 1859.*

## MONTHLY RESULTS.

|                                                                |    |    | Inches |
|----------------------------------------------------------------|----|----|--------|
| Mean height of the Barometer for the month,                    | .. | .. | 30.010 |
| Max. height of the Barometer, occurred at 9 A. M. on the 24th, | .. | .. | 30.195 |
| Min. height of the Barometer, occurred at 5 P. M. on the 1st,  | .. | .. | 29.821 |
| <i>Extreme Range</i> of the Barometer during the month,        | .. | .. | 0.374  |
| Mean of the Daily Max. Pressures,                              | .. | .. | 30.087 |
| Ditto ditto Min. ditto,                                        | .. | .. | 29.957 |
| <i>Mean daily range</i> of the Barometer during the month,     | .. | .. | 0.130  |

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|                                                              |    |    | °    |
|--------------------------------------------------------------|----|----|------|
| Mean Dry Bulb Thermometer for the month,                     | .. | .. | 68.7 |
| Max. Temperature occurred at 1 P. M. on the 7th,             | .. | .. | 81.9 |
| Min. Temperature occurred at 6 & 7 A. M. on the 31st,        | .. | .. | 54.0 |
| <i>Extreme range</i> of the Temperature during the month,    | .. | .. | 27.9 |
| Mean of the daily Max. Temperatures,                         | .. | .. | 77.8 |
| Ditto ditto Min. ditto,                                      | .. | .. | 61.6 |
| <i>Mean daily range</i> of the Temperature during the month, | .. | .. | 16.2 |

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|                                                            |    |    | °      |
|------------------------------------------------------------|----|----|--------|
| Mean Wet Bulb Thermometer for the month,                   | .. | .. | 63.3   |
| Mean Dry Bulb Thermometer above Mean Wet Bulb Thermometer, | .. | .. | 5.4    |
| Computed Mean Dew Point for the month,                     | .. | .. | 60.6   |
| Mean Dry Bulb Thermometer above computed Mean Dew Point,   | .. | .. | 8.1    |
|                                                            |    |    | Inches |
| Mean Elastic force of vapour for the month,                | .. | .. | 0.534  |

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|                                                                         |    |    | Troy grains. |
|-------------------------------------------------------------------------|----|----|--------------|
| Mean weight of vapour for the month,                                    | .. | .. | 5.88         |
| Additional weight of vapour required for complete saturation,           | .. | .. | 1.81         |
| Mean degree of humidity for the month, complete saturation being unity, | .. | .. | 0.77         |

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|                                                  |    |    | Inches          |
|--------------------------------------------------|----|----|-----------------|
| Rained 1 day.—Max. fall of rain during 24 hours, | .. | .. | Nil.            |
| Total amount of rain during the month,           | .. | .. | Nil.            |
| Prevailing direction of the Wind,                | .. | .. | N. & N. W. & W. |

*Abstract of the Results of the Hourly Meteorological Observations  
taken at the Surveyor General's Office, Calcutta,  
in the month of December, 1859.*

MONTHLY RESULTS.

Table showing the number of days on which at a given hour any particular wind  
blew, together with the number of days on which at the same hour,  
when any particular wind was blowing, it rained.

| Hour.     | N.           | Rain on.<br>N. E. | Rain on.<br>E. | Rain on.<br>S. E. | Rain on.<br>S. | Rain on.<br>S. W. | Rain on.<br>W. | Rain on.<br>N. W. | Rain on.<br>Calm. | Rain on. | Missed. |
|-----------|--------------|-------------------|----------------|-------------------|----------------|-------------------|----------------|-------------------|-------------------|----------|---------|
|           | No. of days. |                   |                |                   |                |                   |                |                   |                   |          |         |
| Midnight. | 14           | 1                 |                |                   |                |                   | 2              | 9                 |                   |          | 1       |
| 1         | 13           | 1                 |                |                   |                |                   | 3              | 10                |                   |          |         |
| 2         | 12           | 1                 |                |                   |                |                   | 4              | 10                |                   |          |         |
| 3         | 12           |                   |                |                   |                |                   | 4              | 9                 |                   |          | 2       |
| 4         | 12           | 1                 |                |                   |                |                   | 5              | 7                 |                   |          | 2       |
| 5         | 12           | 1                 |                |                   |                |                   | 5              | 8                 |                   |          | 1       |
| 6         | 14           | 1                 |                |                   |                |                   | 4              | 8                 |                   |          |         |
| 7         | 16           | 1                 |                |                   |                |                   | 3              | 8                 |                   |          |         |
| 8         | 14           | 4                 | 1              |                   |                |                   | 4              | 4                 |                   |          |         |
| 9         | 17           | 3                 | 1              | 2                 |                |                   | 1              | 4                 |                   |          |         |
| 10        | 16           | 5                 |                | 1                 | 1              |                   | 1              | 3                 |                   |          |         |
| 11        | 14           | 5                 |                | 1                 | 1              |                   |                | 6                 |                   |          |         |
| Noon.     | 13           | 3                 |                | 1                 | 1              |                   | 1              | 8                 |                   |          |         |
| 1         | 13           | 1                 |                | 1                 |                |                   | 3              | 8                 |                   |          |         |
| 2         | 9            | 2                 |                |                   |                | 1                 | 3              | 12                |                   |          |         |
| 3         | 9            | 2                 |                |                   |                | 1                 | 3              | 12                |                   |          |         |
| 4         | 11           | 1                 |                |                   |                |                   | 4              | 8                 |                   |          | 3       |
| 5         | 11           |                   |                |                   |                |                   | 5              | 10                |                   |          | 1       |
| 6         | 12           | 3                 |                |                   |                |                   | 3              | 9                 |                   |          |         |
| 7         | 13           | 3                 |                |                   |                |                   | 3              | 8                 |                   |          |         |
| 8         | 14           | 3                 |                |                   |                |                   | 3              | 7                 |                   |          |         |
| 9         | 15           | 3                 |                |                   |                |                   | 3              | 6                 |                   |          |         |
| 10        | 15           | 3                 |                |                   |                |                   | 3              | 6                 |                   |          |         |
| 11        | 15           | 3                 |                |                   |                |                   | 2              | 6                 |                   |          | 1       |



## NOTE BY THE EDITORS.

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Mr. Freeling, when giving us a report on our Coin Cabinet, in May, 1857, suggested an appeal to the friends of the Society throughout India in the following words :

“ In conclusion I would urge that all friends to the Society, among whom must of course be specially included all who themselves feel any interest in Indian numismatics, should be requested to aid in every mode in their power, so that the coin collection may be placed in that rank which would so well befit a Society whose Journal is the depository of the lifelong labours of James Prinsep.”

He pointed out that our collection was very deficient in Bactrians, and, though this department has been since greatly enriched by our purchase of the Stacy Cabinet, it still wants many coins which might be supplied from the Punjab or from duplicates in private collections.

In Pathans of Delhi and in Moguls we have yet many blanks to be supplied, though our extreme poverty in these series is less conspicuous since the purchase above mentioned.

When our Cabinet shall have been properly arranged, a list of the duplicates in our possession which will be available for sale or exchange will be published in the Journal. We shall be glad to introduce into the same list any duplicates in private collections which their owners may wish to dispose of.













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